Michigan Department of Natural Resources
Water Quality Division
June, 1980

An Evaluation of Stream Quality Problems in the Vicinity of Jones Chemical, Monguagon Creek, Riverview, Michigan
February, 1980

On February 12, 1980, Jack Bails, Chief, Environmental Enforcement Division, requested by memo, an evaluation of the impacts of unpermitted discharges from Jones Chemical on Monguagon Creek's sediments and aquatic organisms. As requested, the stream was surveyed during the week of February 18, 1980. The impacts of the large upstream Pennwalt Corporation discharge, were of necessity, also evaluated.

FINDINGS

1. The discharge of very high concentrations (more than 1,000 mg/l) of extremely toxic chlorine from Jones Chemical via an unpermitted discharge has severely damaged Monguagon Creek. Macroscopic bottom dwelling stream life was absent downstream from the discharge for at least 0.15 km (kilometers).

2. Toxic heavy metals have been discharged from Jones Chemical as sediment concentrations of zinc (18,000 mg/kg) and lead (920 mg/kg) were markedly elevated below the discharge and were also found at high levels in a discharge sump at the facility.

3. One dead and one distressed fish (gizzard shad) were observed in Monguagon Creek below the Jones Chemical discharge. No other fish were observed.

4. The potential for untreated human waste discharges to Monguagon Creek from Jones Chemical was apparent as toilet tissue was observed in the unpermitted discharge containing chlorine. High fecal coliform counts were also found at an in-plant sump connected with the discharge pipe.

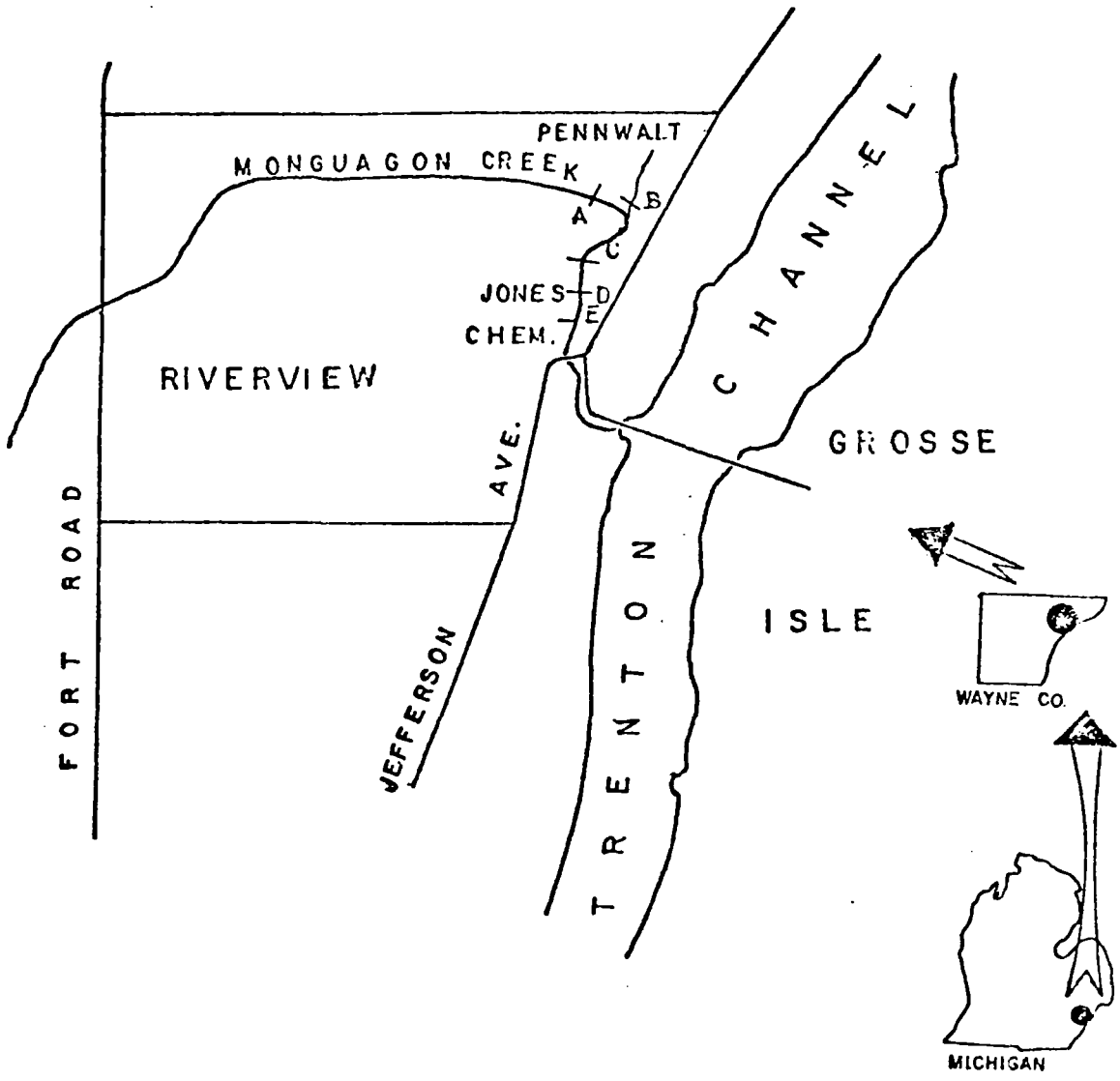
5. Suspended solids in runoff from Jones Chemical were high (490 mg/l) and formed an obvious deposit on the bottom of Monguagon Creek.

6. Pennwalt Corporation's discharge upstream of Jones Chemical is apparently the major source of PCB's and oils in Monguagon Creek sediments, and is also a significant source of toxic heavy metals. Most sediment contaminants in areas impacted by the Pennwalt discharge exceeded the U.S. EPA "heavily polluted" levels for dredge spoils.

7. A visible sheen of oil was observed on Monguagon Creek downstream of the Pennwalt Corporation's discharge (006) at all times during the study. This is a violation of their NPDES permit No. MI0002381.

8. The Pennwalt Corporation's discharge caused some damage to Monguagon Creek as indicated by the numbers, kinds and weight of macroscopic bottom dwelling organisms.

Figure 1. Location and sampling stations on Monguagon Creek, Wayne County, Michigan, February 20, 1980.



Macroinvertebrate samples were collected on transects across Monguagon Creek. Samples were collected at points equidistant from the streambanks and each other along the transect. Three macroinvertebrate samples were taken where the stream was relatively narrow (stations A, B and E) while five samples were collected at stations C and D.

Samples taken with the ponar bottom grab were emptied into a small plastic tub to facilitate sample transfer into plastic bags. Samples were kept cool and returned to the Water Quality Division Biology Laboratory where they were washed in a U.S. Standard 30 mesh sieve bucket the following day. Sample remains after sieving were placed in widemouth quart jars and preserved with formalin. Animals were later removed from the sample using a 4x sorting lens, identified and counted with the aid of a dissecting microscope and weighed. All values have been multiplied by a correction factor (43) to convert raw data to numbers or grams weight per square meter. Animals to be weighed were placed on a paper towel for about a minute to remove water and weighed to the nearest 0.01 gram on a Mettler balance Model P162. After weighing, the animals were placed in a permanent storage solution in 4 dram screw top vials and retained under lock and key for further reference if necessary.

At each sampling site a station card was filled out to record general obvervations and/or conditions at the time. Photographs were also taken upstream and downstream from each sampling station. Photos from stations D and E were not usable because of accidental film exposure.

BACKGROUND

Monguagon Creek is located in southeastern Michigan in Wayne County and flows to the Trenton Channel (Detroit River) near Grosse Ile. The creek is named Huntington Creek on the USGS Wyandotte quadrangle 7.5 minute topographic map of 1973. Although not named on official Michigan County maps, Monguagon Creek is the recognized local name and appears on NPDES discharge permits.

Monguagon Creek is a first order stream (lacks tributaries) and has a total length of about 4.2 km. The once in 10 year 7-day low flow has been estimated at 0.0 m^3/day. The stream flows from its headwaters northeast to Riverview then west to the Detroit River. About 1.2 km upstream from its Detroit River confluence, the Pennwalt Corporation discharges 32,700 m^3/day of treated wastewater via discharge 006 under an NPDES permit (number MI0002381). A half kilometer downstream, Jones Chemical had two unpermitted discharges. Additional water and contaminants enter the stream from stormsewer discharges and urban or industrial runoff both upstream and downstream of the study area.

Most of the stream in Riverview has been enclosed. All of the stream has been channelized for drainage improvement and some sections have been dredged more than once to remove accumulated materials. In the 1950's, raw sewage from Riverview was discharged into the creek and extensive fish kills occurred on occasion (Robert Parker - personal communication). Sewage discharges have since been removed.

The unpermitted discharge from Jones Chemical to Monguagon Creek was found during an aerial reconnaissance flight on December 17, 1979 by William Murphy,

An oil sheen was observed in the Pennwalt discharge channel and at all downstream stations during this study (Appendices X-XIII). This is in violation of the NPDES discharge permit which stipulates "no visible film" in Monguagon Creek.

A single water sample collected February 20, 1980 from a 15 cm (6 inch) diameter steel pipe (#1 discharge) apparently discharging stormwater runoff and/or snow melt at the time, had 490 mg/l suspended solids (lab sheet not included) and resulted in sediment deposition in the stream (Figure 3). Some control measures should be sought for this discharge.

Another water sample was taken from the other Jones Chemical discharge (#2) in which the extremely high levels of chlorine were found and analyzed for fecal coliform bacteria. Counts of fecal bacteria were less than 100 per 100 ml as would be expected with high levels of chlorine (Appendix IV). Toilet paper was seen in the effluent at the time of sampling (Appendices XI and XII). Whenever chlorine was not being discharged, raw sewage could have been discharged. In either case, treatment of human wastes would have been inadequate.

Sediment Contaminants

Substances such as heavy metals, oils and synthetic organic compounds which are relatively insoluable in water will usually be found in stream or lake sediments at concentrations many times higher than can be found in the water. Contaminants of this type will also remain bound in sediments for extended time periods and thus reflect past discharges of contaminants. Many of these sediment contaminants are toxic to aquatic life when concentrations are elevated. Presently, the degree of sediment contamination or its pollutional status is based on the 1977 EPA dredge spoils criteria.

Using EPA's criteria as a basis for comparison, all stations had "heavily polluted" sediments for a number of parameters. At station A, oil (5500 mg/kg) arsenic (12 mg/kg), zinc (440 mg/kg), lead (90 mg/kg), iron (25,000 mg/kg), copper (50 mg/kg) and PCB (10 mg/kg) (Appendix VI) were the contaminants above the non-polluted level of the EPA (1977) dredge spoils criteria (Appendix VII). These sediment contaminants have probably reached Monguagon Creek via urban runoff or discharges upstream in the City of Riverview or from landfills and nearby industrialized areas.

In Pennwalt's discharge channel (station B) and downstream at station C every parameter, except iron, at least doubled in concentration in sediments. In addition, cyanide (5-6 mg/kg), cadmium (6-10 mg/kg), nickel (90-120 mg/kg), and mercury (2 mg/kg) were found at "heavily polluted" areas.

Immediately downstream of the Jones Chemical discharges most sediment contaminant concentrations (station D) were similar to those found upstream at Station A or C. However, higher concentrations of copper, iron, nickel, lead, zinc and manganese existed in the sample collected nearest Jones Chemical. Zinc values were 4700 mg/kg in this sample and 2500 mg/kg in the sample across the stream. As indicated before by Stone's data, the Jones Chemical discharge probably contained high levels of lead, zinc and iron. Zinc was apparently being precipitated quickly once it reached the stream and other metals at lower rates.

Downstream at station E the concentration of lead (920 mg/kg), nickel (230 mg/kg), copper (250 mg/kg), chromium (390 mg/kg), cadmium (10 mg/kg) and cyanide (12 mg/kg) about doubled again. Zinc was found at 18,000 mg/kg, an extremely high sediment

concentration. These very high levels of contaminants probably existed at this location mainly as a result of discharges from Pennwalt and Jones Chemical. The marked increase in certain of the above parameters in downstream sediments at station E was probably the result of additional loadings of heavy metals from Jones Chemical and the chemical reaction and precipitation of these substances after the highly chlorinated Jones Chemical discharge were mixed with the receiving waters.

Macroinvertebrates

Animal communities living in or on the bottom of lakes and streams are the best indicators of aquatic environmental conditions. These animal communities are ubiquitous in undisturbed streams. Benthic or bottom dwelling animal species which together constitute a benthic community live most or all of their lives in the water. Aquatic insects, with rare exception, leave the water for short periods to mate and lay eggs but their immature larval stages may exist for more than a year in an aquatic environment. Aquatic worms (oligochaetes) spend all their lives in the aquatic environment. During this extended period of aquatic development they react to a myriad of physical and chemical parameters and thus are indicators of past environmental conditions.

A stream comparable in size to Monguagon Creek, under relatively unmodified stream conditions, would have benthic communities made up of many species of animals without a dominant species or species group. Biomass (weight per unit area) would usually be at intermediate levels (10-50 gm/m^2 wet weight) and distributed among a number of species. Macroinvertebrate density (number per unit area) would usually range from 1-5000/m^2. Discharges of pollutants in sufficient quantities results in marked and easily detected changes in benthic community structure. Sensitive species or species groups are eliminated and the benthic community becomes dominated by more pollution tolerant forms. Under moderately polluted conditions some forms may thus reach extreme densities and biomass. If pollution is increased further, all the above benthos parameters decrease. In the most extreme situations benthic communities are absent.

The macroinvertebrate communities of Monguagon Creek indicated a degraded to highly degraded stream condition (Figure 4). Pollution tolerant organisms dominated the macroinvertebrate community in the study area. Oligochaetes or aquatic worms comprised more than 90 percent of all the macroinvertebrates collected both in terms of density and biomass (Appendix VIII). Only at station A were significant numbers of midges (Procladius) collected. This animal feeds on worms but is less tolerant of extreme environmental stress than oligochaetes.

Macroinvertebrate densities decreased from almost 24,000/m^2 at station A to 318/m^2 at station D. No macroinvertebrates were found at station E nor in the three samples closest to the Jones Chemical discharge at station D.

Fish

Only two fish (gizzard shad) were observed in this shallow, open stream. Even this was surprising under the conditions. One dead gizzard shad was found just below the Jones Chemical discharge. Apparently the fish had died recently as deterioration was not evident. The second fish was disoriented and swimming in circles as it moved downstream in the vicinity of station E. Total chlorine at 1.4 mg/l was found at this station and by itself was sufficient to cause

death in less than half an hour (Mattice and Zittel, 1976).

SUMMARY AND CONCLUSIONS

Benthic animals communities, or their absence in Monguagon Creek indicated stream conditions that ranged from degraded to completely degraded. Degradation or damage to the benthic communities was associated with high concentrations of sediment contaminants such as oils, toxic heavy metals, cyanide and high concentrations of chlorine in the water. Similar responses of benthic communities to such contaminants have been observed many times before (Mackenthun, 1969). Recently, Wentsel and McIntosh (1977) also found oligochaete dominated benthic communities where heavy metals in lake sediments were extremely high (cadmium-996 mg/kg, zinc-14,033 mg/kg, and chromium-2106 mg/kg) and midge larvae were present only where heavy metals decreased in the sediment. Given the concentrations of sediment contaminants in Monguagon Creek, it is improbable that the elimination of the benthic community downstream of the Jones Chemical discharge was due only to their discharge of heavy metals. The pattern of benthos elimination closely approximated the area of stream bottom impacted by the plume from the Jones Chemical unpermitted discharge with very high concentrations of extremely toxic chlorine. It is therefore very reasonable to conclude that a minimum of 0.15 km of Monguagon Creek has been damaged as a result of the unpermitted Jones Chemical discharge.

Damage to Monguagon Creek undoubtedly also extends for the remaining 0.7 km to its confluence with the Trenton Channel. Sediment contaminants would surely remain at or above concentrations similar to those found downstream of the Pennwalt discharge, as most of these substances do not biodegrade readily and channel erosion processes tend to transport sediments downstream. It is not certain however, that the macroinvertebrate community has been eliminated in this lower stream reach nor could any or all damage be blamed with certainty on the upstream discharges. Storm sewers and runoff from streets, coal piles and the surrounding area would have degrading effects in the lower stream reach. Furthermore, it is not certain whether chlorine concentrations have been at toxic concentrations to the Trenton Channel in the past because chlorine readily reacts and loses its toxicity.

In order to expedite the recovery of Monguagon Creek several actions should be undertaken. A study of Monguagon Creek upstream of the study site and in Riverview should be undertaken to determine the source(s) of stream contaminants. Pennwalt's wastewater treatment should be upgraded to meet NPDES requirements and the Jones Chemical discharges should either be eliminated or adequate treatment be provided to protect Monguagon Creek. In addition, the highly contaminated sediments downstream of Pennwalt and Jones Chemical should be removed, not only to facilitate stream recovery but to prevent their discharge to the Trenton Channel.

PEAS 205-80

MICHIGAN DEPT. OF NATURAL RESOURCES, ENVIRONMENTAL LABORATORY ANALYSIS -- ENIVRONMENTAL QUALITY - WATER - GENERAL USAGE

LAB LOG# 4566 PROJ CODE SD COST CENTER ____ FR ___ COLLECTED BY Lawrence Gilmore TRANSFERED TO ____ RECEIVED AT LAB ____ EXAMINER J. Lee Cole

LOCATION SAMPLED Jones Chemical - Riverview SAMPLE REMARKS* High pH - chlorine present SEND RESULTS TO (NAME & SECTION) Bill Stone Dist #1

FIELD ID.	DESCRIPTION OF SAMPLING SITE OR SAMPLE	REF NO. P	STORET NUMBER	START DATE YYMMDD	TIME MIL TTTT	DEPTH FEET	LAB NO. C 00008	TEMP. DEGREE CENT. 00010	OXYGEN DIS. MG/L 00300	PH STAND. UNITS 00400	COND. 25 C US/CM 00095	BOD-5 TOTAL MG/L 00310	C.O.D. LOW MG/L 00335	T.O.C. AMPUL MG/L 00680	NO3NO2 TOTAL MG/L 00630
1	upstream-top (surface)	101		800209	1650		5035			7.7 SC					
2	downstream-top (surface)	102		800209	1650		5036			7.6 SC					
3	discharge-Bottom	103		800209	1650		5037			15.7 SC					
4	discharge-top (surface)	104		800209	1650		5038			11.3 SC					
		105													
		106													
		107													
		108													
		109													
		110													

REF NO.	NO3 TOTAL MG/L N 00620	NO2 TOTAL MG/L N 00615	NH3 TOTAL MG/L N 00610	KJEL N TOTAL MG/L N 00625	ORTH.P TOTAL MG/L P 70507	PHOS. TOTAL MG/L P 00665	CA TOTAL MG/L 00916	MG TOTAL MG/L 00927	NA TOTAL MG/L 00929	K TOTAL MG/L 00937	F TOTAL MG/L 00951	CL TOTAL MG/L 00940	SI REACT. MG/L 00958	S= TOTAL MG/L S 00745	SO4= TOTAL MG/L 00945	ALK. TOTAL MG/L 00410		
01	C								24 SC			41 SC			34 SC			
02	C								25 SC			43 SC			35 SC			
03	C								9100 SC			2400 SC			3200 SC			
04	C								150 SC			166 SC			43 SC			
05	C																	
06	C																	
07	C																	
08	C																	
09	C																	
10	C																	

FSD 23200 10/79

* - These samples are in improper containers because this was an emergency sampling done by a Conservation Officer

MICHIGAN DEPT. OF NATURAL RESOURCES, ENVIRONMENTAL LABORATORY ANALYSIS -- ENV. QUALITY-WATER - POINT SOURCE STUDIES SEC.

LAB LOG# 4514 PROJ CODE IE COST CENTER ------ PR 1 COLLECTED BY W.E. STONE TRANSFERED TO Wm. Mugha RECEIVED AT LAB 4 EXAMINER [illegible]

LOCATION SAMPLED Jones Chemical Co. - Riverview SAMPLE REMARKS Kept Chilled SEND RESULTS TO (NAME & SECTION) Bill Murphy ENE. ESD. DLK

FIELD ID.	"DO NOT PUNCH" DESCRIPTION OF SAMPLING SITE OR SAMPLE	REF NO. P	STORET NUMBER	START DATE YYMMDD	TIME MIL TTTT	S,T OR B	NUM SAM-PLES	END DATE YYMMDD	TIME MIL TTTT	DEP-TH FEET	LAB NO. 2 00008	TEMP. DEGREE CENT. 00010	PH STAND. UNITS 00400	CL2 RES MG/L 50060	BOD-5 TOTAL MG/L 00310	C.O.D. HIGH MG/L 00340
1	Pipe to Sump	C01		800214	12.15						5159			None		
2	in the Outside Sump	C02		"	12.15						5160			high		
3	Outfall at Creek	C03		"	12.40						5161			high		
4	" " "	C04		"	12.45						5162			high		
5	" " "	C05		"	12.45						5163			high		
6	" " "	C06		"	12.46						5164			high		
7	Dam NaOCl Pretest Tank	C07		"	13.40						5165			very high		
		C08														
		C09														
		C10														

REF NO.	T.O.C. AMPUL MG/L 00680	NO3NO2 TOTAL MG/L N 00630	NH3 TOTAL MG/L N 00610	ORG N TOTAL MG/L N 00605	PHOS. TOTAL MG/L P 00665	CL TOTAL MG/L 00940	S= TOTAL MG/L S 00745	SO4 TOTAL (MG/L) 00945	Na 00929
01				C		86.		50	65
02				C		5300.		INT	8000
03				C		1030.		44	1450
04				C		3300.		INT	8300
05				C		2000.		INT	3900
06				C		14100 PS		INT	5900
07				C		148,000		INT	77000
08				C					
09				C					
10				C					

ESD-00302 REV. 10/79

APPDNDIX V

Royce E. Smith
Managing Director

Duane R. Egeland
Deputy Managing Director,
Director of Engineering

Chester Wozniak
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Deputy Secretary

Wayne
County
Public
Works

800 West Lafayette
Detroit, Michigan
48226

313 224 . 3620

On February 20, 1980, 3:00 p.m. Bill Murphy of the Department of Natural Resources brought in four samples to be tested for residual chlorine. The samples were collected within one half of an hour of analysis.

I tested the samples as numbered below.

#2	0.5	P.P.M. free chlorine 4.3 P.P.M. total chlorine
#3	0.1	P.P.M. free chlorine
#4	9500	P.P.M. free chlorine 9900 P.P.M. total chlorine
#5	0.4	P.P.M. free chlorine 1.4 P.P.M. total chlorine

All samples tested using D.P.D. method of chlorine analysis.

Thomas Shoens, Chemist
Wayne County Public Works

TS/cla

APPENDIX VII

April 1977 U.S. EPA Dredged Spoil Disposal Criteria Classification Guidelines for Great Lakes Harbors. Values in mg/kg dry weight, values otherwise noted.

Parameter	Non Polluted	Moderately Polluted	Heavily Polluted
Volatile solids %	<5	5-8	>8
COD	<40,000	40-80,000	>80,000
TKN	<1,000	1,000-2,000	>2,000
Oil & Grease (Hexane Solubles)	<1,000	1,000-2,000	>2,000
Lead	<40	40-60	>60
Zinc	<90	90-200	>200
Ammonia	<75	75-200	>200
Cyanide	<0.10	0.10-0.25	>0.25
Phosphorus	<420	420-650	>650
Iron	<17,000	17,000-25,000	>25,000
Nickel	<20	20-50	>50
Manganese	<300	300-500	>500
Arsenic	<3	3-8	>8
Cadmium	*	*	>6
Chromium	<25	25-75	>75
Barium	<20	20-60	>60
Copper	<25	25-50	>50
Mercury			≥1
Total PCB's **			≥10

* Lower limits not established

** The pollutional status of sediments with total PCB concentrations between 1 and 10 mg/kg dry weight will be determined on a case-by-case basis.

APPENDIX IX

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATER QUALITY DIVISION

BIOLOGY SECTION
STREAM PROBLEM ASSESSMENT

Station Number A Investigator(s) EVANS, HORVATH, MURPHY

Date 2/20/80 TIME 12:30 PHOTOGRAPH NUMBER 11, 12, 13

BODY OF WATER MONGUAGON CK LOCATION RIVERVIEW

COUNTY WAYNE T4S R11E S 5 THP RIVERVIEW

REASON FOR SURVEY JONES CHEMICAL - PENNWALT DISCHARGE IMPACTS

VICINITY LAND USE: Mostly Forest Mostly Urban Mostly Agriculture Other INDUSTRIAL

AVE. STREAM WIDTH 7 m AVE. STREAM DEPTH 0.5 m VELOCITY <0.1 ms STREAM km 1.32

STREAM SHADING: Open Partly Open Shaded STREAM TYPE: Coldwater Warmwater

WATER TEMP. 5 °C AIR TEMP. 6 °C WEATHER: Sunny – Partly Cloudy – Cloudy – Rainy DAM u/s: Yes No ____ km

CHANNELIZED: Yes No CHANNEL EROSION: None — Slight — Moderate — Severe HIGH WATER MARK 0.16 m

SECCHI DISC TRANS: ____ m TURBIDITY: Clear — Slightly Turbid — Turbid — Opaque WATER COLOR ____

WATER ODORS: Normal Sewage Petroleum Chemical Other ____

SURFACE OILS: None Slick Sheen Globs Flecks

SEDIMENT ODORS: Normal Sewage Petroleum Chemical Anaerobic Other ____

SEDIMENT OILS: Absent Slight Moderate Profuse

DEPOSITS: Sludge Sawdust Paperfiber Sand Relict Shells Other TWIGS + LEAVES

ARE THE UNDERSIDES OF STONES WHICH ARE NOT DEEPLY IMBEDDED IN SUBSTRATE BLACK? YES NO NA

SUBSTRATE TYPE	FLOW VELOCITY m/sec	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
BOULDERS*	>1.2 (>3 fps)	256 mm (10") dia.	
RUBBLE*	>0.6 (>2 fps)	64-256 mm (2.1-10") dia.	
GRAVEL*	>0.3 (>1 fps)	2-64 mm (0.1-2.5") dia.	
SAND	>0.2 (>0.7 fps)	0.06-2.00 mm dia. Gritty texture	5
SILT	>0.12 (>0.4 fps)	0.004-0.006 mm dia.	
MUCK-MUD	<0.12 (<0.4 fps)	black, very find organic	90

*IMBEDDEDNESS: 0 = NONE 1 = 1/3 OR LESS 2 = 2/3 OR MORE

SUBSTRATE TYPE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
CLAY	Slick texture	
MARL	Grey, shell fragments	
DETRITUS	Sticks, wood, coarse plant materials	5
FIBROUS PEAT	Partially decomposed plant material	
PULPY PEAT	Finely divided plant material, parts indistinguishable	
LOGS & STICKS		

BIOTA:

PHYTOPLANKTON	0	1	2	3	4	SLIMES	0	1	2	3	4
PERIPHYTON	0	1	2	3	4	ZOOPLANKTON	0	1	2	3	4
FILAMENTOUS ALGAE	0	1	2	3	4	MACROINVERTEBRATES	0	1	2	3	4
MACROPHYTES	0	1	2	3	4	FISH	0	1	2	3	4

0 - Absent 1 - Sparse 2 - Moderate 3 - Abundant 4 - Profuse

APPENDIX X

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATER QUALITY DIVISION

BIOLOGY SECTION
STREAM PROBLEM ASSESSMENT

Station Number B Investigator(s) EVANS HORVATH, MURPHY

Date 8/30/79 TIME 12:45 PHOTOGRAPH NUMBER 14, 15, 16, 17

BODY OF WATER MONGUAGON CREEK LOCATION RIVERVIEW

COUNTY WAYNE T4S R11E S 5 TWP RIVERVIEW

REASON FOR SURVEY JONES CHEMICAL - PENNWALT DISCHARGE IMPACTS

VICINITY LAND USE: Mostly Forest Mostly Urban Mostly Agriculture Other INDUSTRIAL

AVE. STREAM WIDTH 5 m AVE. STREAM DEPTH 0.3 m VELOCITY >0.12 ms STREAM km 1.20

STREAM SHADING: Open Partly Open Shaded STREAM TYPE: Coldwater Warmwater

WATER TEMP. 11 °C AIR TEMP. 5 °C WEATHER: Sunny – Partly Cloudy – Cloudy – Rainy DAM u/s: Yes No ____ km

CHANNELIZED: Yes No CHANNEL EROSION: None — Slight — Moderate — Severe HIGH WATER MARK 0.16 m

SECCHI DISC TRANS: ____ m TURBIDITY: Clear — Slightly Turbid — Turbid — Opaque WATER COLOR ____

WATER ODORS: Normal Sewage Petroleum Chemical Other ____

SURFACE OILS: None Slick Sheen Globs Flecks

SEDIMENT ODORS: Normal Sewage Petroleum Chemical Anaerobic Other ____

SEDIMENT OILS: Absent Slight Moderate Profuse

DEPOSITS: Sludge Sawdust Paperfiber Sand Relict Shells Other ____

ARE THE UNDERSIDES OF STONES WHICH ARE NOT DEEPLY IMBEDDED IN SUBSTRATE BLACK? YES NO NA

SUBSTRATE TYPE	FLOW VELOCITY m/sec	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
BOULDERS*	>1.2 (>3 fps)	256 mm (10") dia.	
RUBBLE*	>0.6 (>2 fps)	64-256 mm (2.1-10") dia.	
GRAVEL*	>0.3 (>1 fps)	2-64 mm (0.1-2.5") dia.	
SAND	>0.2 (>0.7 fps)	0.06-2.00 mm dia. Gritty texture	50
SILT	>0.12 (>0.4 fps)	0.004-0.006 mm dia.	
MUCK-MUD	>0.12 (>0.4 fps)	black, very find organic	50

*IMBEDDEDNESS: 0 = NONE 1 = 1/3 OR LESS 2 = 2/3 OR MORE

SUBSTRATE TYPE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
CLAY	Slick texture	
MARL	Grey, shell fragments	
DETRITUS	Sticks, wood, coarse plant materials	
FIBROUS PEAT	Partially decomposed plant material	
PULPY PEAT	Finely divided plant material, parts indistinguishable	
LOGS & STICKS		

BIOTA:

PHYTOPLANKTON	0	1	2	3	4	SLIMES	0	1	2	3	4
PERIPHYTON	0	1	2	3	4	ZOOPLANKTON	0	1	2	3	4
FILAMENTOUS ALGAE	0	1	2	3	4	MACROINVERTEBRATES	0	1	2	3	4
MACROPHYTES	0	1	2	3	4	FISH	0	1	2	3	4

0 - Absent 1 - Sparse 2 - Moderate 3 - Abundant 4 - Profuse

APPENDIX XI

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATER QUALITY DIVISION

BIOLOGY SECTION
STREAM PROBLEM ASSESSMENT

Station Number C Investigator(s) EVANS, HORVATH,

Date 2/20/80 TIME 13:15 PHOTOGRAPH NUMBER 18, 19, 20

BODY OF WATER MONGUAGON CREEK LOCATION RIVERVIEW

COUNTY WAYNE T4S R11E S 5 TWP RIVERVIEW

REASON FOR SURVEY JONES CHEMICAL - PENNWALT DISCHARGE IMPACTS

VICINITY LAND USE: Mostly Forest Mostly Urban Mostly Agriculture Other INDUSTRIAL

AVE. STREAM WIDTH 20 m AVE. STREAM DEPTH 0.3 m VELOCITY 0.12 ms STREAM km 0.75

STREAM SHADING: Open Partly Open Shaded STREAM TYPE: Coldwater Warmwater

WATER TEMP. 7.7 °C AIR TEMP. 5 °C WEATHER: Sunny – Partly Cloudy – Cloudy – Rainy DAM u/s: Yes No ____ km

CHANNELIZED: Yes No CHANNEL EROSION: None — Slight — Moderate — Severe HIGH WATER MARK 0.15 m

SECCHI DISC TRANS: ____ m TURBIDITY: Clear — Slightly Turbid — Turbid — Opaque WATER COLOR ____

WATER ODORS: Normal Sewage Petroleum Chemical Other ____

SURFACE OILS: None Slick Sheen Globs Flecks

SEDIMENT ODORS: Normal Sewage Petroleum Chemical Anaerobic Other ____

SEDIMENT OILS: Absent Slight Moderate Profuse

DEPOSITS: Sludge Sawdust Paperfiber Sand Relict Shells Other ____

ARE THE UNDERSIDES OF STONES WHICH ARE NOT DEEPLY IMBEDDED IN SUBSTRATE BLACK? YES NO NA

SUBSTRATE TYPE	FLOW VELOCITY m/sec	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
BOULDERS*	>1.2 (>3 fps)	256 mm (10") dia.	
RUBBLE*	>0.6 (>2 fps)	64-256 mm (2.1-10") dia.	
GRAVEL*	>0.3 (>1 fps)	2-64 mm (0.1-2.5") dia.	
SAND	>0.2 (>0.7 fps)	0.06-2.00 mm dia. Gritty texture	
SILT	>0.12 (>0.4 fps)	0.004-0.006 mm dia.	
MUCK-MUD	>0.12 (>0.4 fps)	black, very find organic	95

*IMBEDDEDNESS: 0 = NONE 1 = 1/3 OR LESS 2 = 2/3 OR MORE

SUBSTRATE TYPE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
CLAY	Slick texture	
MARL	Grey, shell fragments	
DETRITUS	Sticks, wood, coarse plant materials	5
FIBROUS PEAT	Partially decomposed plant material	
PULPY PEAT	Finely divided plant material, parts indistinguishable	
LOGS & STICKS		

BIOTA:

PHYTOPLANKTON	0	1	2	3	4	SLIMES	0	1	2	3	4
PERIPHYTON	0	1	2	3	4	ZOOPLANKTON	0	1	2	3	4
FILAMENTOUS ALGAE	0	1	2	3	4	MACROINVERTEBRATES	0	1	2	3	4
MACROPHYTES	0	1	2	3	4	FISH	0	1	2	3	4

0 - Absent 1 - Sparse 2 - Moderate 3 - Abundant 4 - Profuse

APPENDIX XII

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATER QUALITY DIVISION

BIOLOGY SECTION
STREAM PROBLEM ASSESSMENT

Station Number D Investigator(s) EVANS, HORVATH

Date 2/20/80 TIME 13:45 PHOTOGRAPH NUMBER —

BODY OF WATER MONGUEGON CREEK LOCATION RIVERVIEW

COUNTY WAYNE T4S R11E S 5 TWP RIVERVIEW

REASON FOR SURVEY JONES CHEMICAL - PENNWALT DISCHARGE IMPACT

VICINITY LAND USE: Mostly Forest Mostly Urban Mostly Agriculture Other INDUSTRIAL

AVE. STREAM WIDTH 20 m AVE. STREAM DEPTH 0.3 m VELOCITY 0.12 ms STREAM km 0.68

STREAM SHADING: Open Partly Open Shaded STREAM TYPE: Coldwater Warmwater

WATER TEMP. 7.7 °C AIR TEMP. 5 °C WEATHER: Sunny – Partly Cloudy – Cloudy – Rainy DAM u/s: Yes No ____ km

CHANNELIZED: Yes No CHANNEL EROSION: None — Slight — Moderate — Severe HIGH WATER MARK 0.15 m

SECCHI DISC TRANS: ____ m TURBIDITY: Clear — Slightly Turbid — Turbid — Opaque WATER COLOR ____

WATER ODORS: Normal Sewage Petroleum Chemical Other ____

SURFACE OILS: None Slick Sheen Globs Flecks

SEDIMENT ODORS: Normal Sewage Petroleum Chemical Anaerobic Other ____

SEDIMENT OILS: Absent Slight Moderate Profuse

DEPOSITS: Sludge Sawdust Paperfiber Sand Relict Shells Other ____

ARE THE UNDERSIDES OF STONES WHICH ARE NOT DEEPLY IMBEDDED IN SUBSTRATE BLACK? YES NO NA

SUBSTRATE TYPE	FLOW VELOCITY m/sec	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
BOULDERS*	>1.2 (>3 fps)	256 mm (10") dia.	
RUBBLE*	>0.6 (>2 fps)	64-256 mm (2.1-10") dia.	
GRAVEL*	>0.3 (>1 fps)	2-64 mm (0.1-2.5") dia.	
SAND	>0.2 (>0.7 fps)	0.06-2.00 mm dia. Gritty texture	
SILT	>0.12 (>0.4 fp. ,	0.004-0.006 mm dia.	
MUCK-MUD	>0.12 (>0.4 fps)	black, very find organic	95

*IMBEDDEDNESS: 0 = NONE 1 = 1/3 OR LESS 2 = 2/3 OR MORE

SUBSTRATE TYPE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
CLAY	Slick texture	
MARL	Grey, shell fragments	
DETRITUS	Sticks, wood, coarse plant materials	5
FIBROUS PEAT	Partially decomposed plant material	
PULPY PEAT	Finely divided plant material, parts indistinguishable	
LOGS & STICKS		

BIOTA:

PHYTOPLANKTON	0	1	2	3	4	SLIMES	0	1	2	3	4
PERIPHYTON	0	1	2	3	4	ZOOPLANKTON	0	1	2	3	4
FILAMENTOUS ALGAE	0	1	2	3	4	MACROINVERTEBRATES	0	1	2	3	4
MACROPHYTES	0	1	2	3	4	FISH	0	1	2	3	4

0 - Absent 1 - Sparse 2 - Moderate 3 - Abundant 4 - Profuse

APPENDIX XIII

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WATER QUALITY DIVISION

BIOLOGY SECTION
STREAM PROBLEM ASSESSMENT

Station Number E Investigator(s) EVANS, HORVATH

Date 2/22/80 TIME 14:15 PHOTOGRAPH NUMBER ———

BODY OF WATER MONGUAGON CREEK LOCATION RIVERVIEW

COUNTY WAYNE T4S R11E S 5 TWP RIVERVIEW

REASON FOR SURVEY JONES CHEMICAL - PENNWALT DISCHARGE IMPACTS

VICINITY LAND USE: Mostly Forest Mostly Urban Mostly Agriculture Other INDUSTRIAL

AVE. STREAM WIDTH 13 m AVE. STREAM DEPTH 0.4 m VELOCITY 0.12 ms STREAM km 0.53

STREAM SHADING: Open Partly Open Shaded STREAM TYPE: Coldwater Warmwater

WATER TEMP. 7.7 °C AIR TEMP. 5.6 °C WEATHER: Sunny – Partly Cloudy – Cloudy – Rainy DAM u/s: Yes No ____ km

CHANNELIZED: Yes No CHANNEL EROSION: None — Slight — Moderate — Severe HIGH WATER MARK 0.15 m

SECCHI DISC TRANS: ——— m TURBIDITY: Clear — Slightly Turbid — Turbid — Opaque WATER COLOR ———

WATER ODORS: Normal Sewage Petroleum Chemical Other ____

SURFACE OILS: None Slick Sheen Globs Flecks

SEDIMENT ODORS: Normal Sewage Petroleum Chemical Anaerobic Other ____

SEDIMENT OILS: Absent Slight Moderate Profuse

DEPOSITS: Sludge Sawdust Paperfiber Sand Relict Shells Other ____

ARE THE UNDERSIDES OF STONES WHICH ARE NOT DEEPLY IMBEDDED IN SUBSTRATE BLACK? YES NO NA

SUBSTRATE TYPE	FLOW VELOCITY m/sec	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
BOULDERS*	>1.2 (>3 fps)	256 mm (10") dia.	
RUBBLE*	>0.6 (>2 fps)	64-256 mm (2.1-10") dia.	
GRAVEL*	>0.3 (>1 fps)	2-64 mm (0.1-2.5") dia.	
SAND	>0.2 (>0.7 fps)	0.06-2.00 mm dia. Gritty texture	
SILT	>0.12 (>0.4 fps)	0.004-0.006 mm dia.	5
MUCK-MUD	<0.12 (<0.4 fps)	black, very find organic	90

*IMBEDDEDNESS: 0 = NONE 1 = 1/3 OR LESS 2 = 2/3 OR MORE

SUBSTRATE TYPE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
CLAY	Slick texture	
MARL	Grey, shell fragments	
DETRITUS	Sticks, wood, coarse plant materials	5
FIBROUS PEAT	Partially decomposed plant material	
PULPY PEAT	Finely divided plant material, parts indistinguishable	
LOGS & STICKS		

BIOTA:

PHYTOPLANKTON	0	1	2	3	4	SLIMES	0	1	2	3	4
PERIPHYTON	0	1	2	3	4	ZOOPLANKTON	0	1	2	3	4
FILAMENTOUS ALGAE	0	1	2	3	4	MACROINVERTEBRATES	0	1	2	3	4
MACROPHYTES	0	1	2	3	4	FISH	0	1	2	3	4

0 - Absent 1 - Sparse 2 - Moderate 3 - Abundant 4 - Profuse

COMPUTATION SHEET

USEPA, REGION V, MICHIGAN – OHIO DISTRICT OFFICE

YEAR

RECEIVED FROM	TIME	DATE	☐ CUSTODY ☐ NON-CUSTODY	REMARKS	GIVEN TO

SOURCE OF SAMPLE: WYANDOTTE STP (EL01), PENNWALT (EL02) — SAMPLE DATE

PARAMETER — UNITS

ANALYZED BY — DATE — CHECKED BY [signature] — DATE 11/14/80

MODO Nos.	STATION	COND @ 25°C	TOTAL SOLIDS	SUSP. SOLIDS	BOD_5	TOTAL PHENOLS	TOTAL CYANIDE	OIL & GREASE	
81 EL01 WYANDOTTE		number	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
S01	INF	986	4153	3472 (3576)	626	0.056	<.005	—	
S04	INF	—	—	(3576)	—	—	—	66	
S08	EFF	792	538	21	16	0.007	0.096	—	
S11	EFF	—	—	—	—	—	(0.092)	<1	
S23	SLUDGE	—	—	—	—	0.026	<.005	—	
		COND	SULFIDE	SUSP SOLIDS	BOD_5	PHENOL		G&O	STAT.
81 EL02 PENNWALT		number	mg/l	mg/l	mg/l	mg/l	SAMPLE #	mg/l	
S01	001	232	—	8	—	—	S02	<1	001
							S03	3	001
S04	002	276	—	11	—	—	S05	<1	002
							S06	<1	002
S07	003	629	—	5	—	—	S08	2	003
							S09	<1	003
S10	005	21,608	—	<5	—	—	S11	<1	005
							S12	1	005
S13	006	244	(S14) <.02	10	9	0.011	S14	<1	006
			(S15) <.02				S15	<1	006
S16	INF	232	—	6	3	<.002	S17	<1	INF
							S18	<1	INF
D19	INF	232	—	8	<2	<.002			
S29	INF TO POND #4	247	(S30) <.02	7	—	0.039			
			(S31) <.02	(10)					
S20	INF TO #2	—	—	—	—	0.620			
S26	INF TO #1	—	—	—	—	<.002			

SPECIAL REMARKS: ( ) = AQC VALUES; pH & BACTI NOT RUN DUE TO EXCESSIVE HOLDING TIMES

HEXAVALENT CHROMIUM = <0.005 for EL01 S01 & S08

(5/77)

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION BUREAU
POINT SOURCE STUDIES SECTION

Report of an
Industrial Wastewater Survey
Conducted at
PENNWALT CHEMICAL CORPORATION
All Outfalls No. 820298
NPDES No. MI0002381
Wayne County
Wyandotte, Michigan
July 7-8, 1980

Survey Summary

Wastewater monitoring was performed during one twenty-four hour survey period starting Monday, July 7, 1980.

The results of this survey are compared to the final limitations in the facility's National Pollutant Discharge Elimination System (NPDES) Permit, No. MI0... as established under Final Order of Abatement No. 1981 entered on October 29, 1977.

Based on that comparison the BOD_5 loading limitations at outfall 821088 (006) was exceeded during the survey (Table 3).

The survey results are compared to the company's self-monitoring results reported in the Monthly Operating Report (MOR). The comparison of these results is presented as Table 3. The only major discrepancies occurred at the intake, 820409. Survey concentrations for suspended solids are significantly lower than the concentrations reported by the company on the survey dates. The total iron concentration found at the intake during the survey was also significantly less than any reported by the company for the month (Table 3).

The composite samples were split with the company for comparison of laboratory results. The comparison is presented as Table 4. No major discrepancies are noted.

The last survey performed at this facility was in November, 1978. Since the last survey several process changes have occurred at the plant. The peroxygen, chlorosil and anhydrous caustic process have all been discontinued. Also the liquid ferric process waters have been routed from outfall 003 to outfall 005. These changes have resulted in a sharp decrease in the chlorides concentration and an increase in the total iron concentration this survey at outfall 005. A significant decrease in total iron concentration is also noted at outfall 006 (Table 5).

Survey Comments

The sal ammoniac process was down during the survey period.

The results from organic scans performed for various volatile organics, acid extractables and base/neutral extractables are presented in Table 2.

A 96-hour acute toxicity evaluation of outfall 005 was performed by the bioassay unit the same week in which his survey was conducted. The results from this study are included in a separate report.

Plant Processes

The Pennwalt Corporation in Wyandotte manufactures organic and inorganic chemicals in two separate plants. The inorganic plant manufactures chlori-Alkali industrial chemicals and iron chlorides. The organic plant manufactures industrial organic chemicals and miscellaneous special organic compounds.

The inorganics plant or east complex utilizes salt brine, ammonia, silica, scrap iron and various other raw materials. A process schematic of the plant is depicted in Figure 1. Production facilities and the plant layout are shown in Figure 2.

The organics plant or west complex synthesizes organic compounds from various raw organic materials. The chief products are alkylamines and rubber chemicals. About 100 different compounds are produced at the plant. Figure 3 illustrates the plant layout.

Production at both plants was considered normal during the survey. Both plants operate 24 hrs/day, 7 days/wk. The inorganic plant employs about 300 people and the organic plant about 250 people.

Water Supply, Wastewater & Treatment

All process and cooling water used in both plants is obtained through two intakes on the Trenton Channel of the Detroit River. The north intake (820412) supplies only the barometric condensers in the evaporator department. The south intake (820409) services the remainder of the inorganic plant, the organic plant and the Detroit Edison Plant in the east complex. Domestic water is supplied by the City of Detroit.

Both intakes have a continuous backwash on the intake screens. The south intake's backwash is discharged into the Detroit Edison plant's outfall. Both backwashes are unpermitted. The water from the south intake is periodically chlorinated.

Non-contact cooling water from the chlorine liquidation process is discharged through outfall 820224 (001).

Outfall 820190 (002) discharges cooling water from the barometric condensers and chlorine cell room, rinse wall from sodium hydroxide storage tanks, flue gas scrubber water, sulfuric acid tank cooling water and yard drainage. About 95 of the wastewater originates from the barometric condensers. The pH of the wastewater is adjusted using carbon dioxide, sulfuric acid or caustic prior to discharge.

Outfall 820193 (003) discharges cooling water from the ammonium chloride process. The pH is adjusted using carbon dioxide, sulfuric acid or caustic prior to monitoring and discharge into the Wayne County Drain No. 5.

Seal water from the liquid ferric pumps, chlorine cell room drains, wash water from the evaporators, wash water from the tank room and back wash from two of the filters used to filter caustic are discharged via outfall 820223 (005). The combined waste streams are provided settling in one of two settling lagoons. Following continuous pH adjustment with carbon dioxide, sulfuric acid or caustic, if necessary, the wastewater is monitored and enters a Wayne County Drain prior to entering the Detroit River. The lagoon which is not being used for settling is dredged and the solids disposed of by deep well injection. The lagoon not in use is also used to receive any wastewater generated from the replacement of the asbestoes diagram filters in the chlorine cell room.

All process and cooling water from the organics plant or west complex is treated as depicted in Figure 3. Pond 1 receives wastes from the pilot plant. Sanitary wastes are discharged to Pond 2 for equalization of loadings from the plant. Following a third pond these wastes, other process wastes and cooling water are discharged to Pond 4. The cooling water which comprises about 85% of the total flow through outfall 006 is discharged into the end of Pond 4. The major treatment provided in the treatment scheme is equalization of slug loads, settling and oil skimming and pH adjustment as necessary using sulfuric acid or caustic. After Pond 4 the wastewater is discharged to Monguagon Creek through outfall 821008 (006).

Sludge from the wastewater treatment in the organics plant and residues from plant processes are discharged in a containment lagoon south of the organics plant.

All sanitary wastes are discharged to the city's sanitary sewer system.

Survey Procedure

The flows and samples were obtained as follows:

Outfall	Flow Measurement	Sampling
820103 (001)	Company totalizer.	Automatic air activated sampler & individual grabs.
820190 (002)	Company totalizer.	Submergible sampler & individual grabs.
820193 (003)	Company totalizer.	Automatic air activated sampler & individual grabs.
820223 (005)	11.25 inch Parshall flume and water level recorder.	Automatic air activated sampler & individual grabs.
821008 (006)	Company totalizer.	Automatic air activated sampler & individual grabs.
820412 (North Intake)	None	Submergible sampler & individual grabs.
820409 (South Intake)	None	Submergible sampler & individual grabs.

A water level recorder provides a continuous account of the liquid level or head through a flume. A head versus time graph is obtained for the duration of the survey period. The total volume of wastewater through the flume during the survey period is computed from the graph.

An automatic sampler composites samples at timed intervals.

A submergible sampler obtains samples at a continuous rate.

Polychlorinated biphenyl (PCB) and sulfide composite samples are collected by the grab composite method.

An individual grab is a single instantaneous sample.

Samples were analyzed by the Environmental Protection Bureau Laboratories located in Lansing.

Samples were preserved according to Table 6. The results of the physical, chemical and bacteriological analyses are presented in Tables 1 & 2.

Pennwalt Chemical Corporation - Wyandotte

Table 1 Analyses of composite samples.

Outfalls	820224 (001)		820190 (002)	
Survey Period From	7-7-80 - 1345		7-7-80 - 1655	
To	7-8-80 - 1345		7-8-80 - 1655	
Computed flow rate* (M^3/day)	(21,500)		(55,400)	
	mg/l	kg/day	mg/l	kg/day
Suspended solids	14	300	15	830
Dissolved solids	160	3,400	200	10,000
[illegible]	7	200	9	500
[illegible]	2.0	43	2.4	130
Phenol	0.007	0.2	< 0.005	--
Nitrite & nitrate nitrogen-N	0.36	7.7	0.32	18
Ammonia nitrogen-N	0.23	4.9	0.24	13
Kjeldahl nitrogen-N	0.48	10.	0.52	29
Orthophosphates-P	0.04	0.9	0.05	3
Total phosphorus-P	0.07	2	0.09	5
Chlorides	--	--	36.	2,000
Total cadmium (Cd)	< 0.02	--	< 0.02	--
Total chromium (Cr)	< 0.05	--	< 0.05	--
Total copper (Cu)	< 0.02	--	< 0.02	--
Total nickel (Ni)	< 0.05	--	< 0.05	--
Total lead (Pb)	< 0.05	--	< 0.05	--
Total zinc (Zn)	< 0.05	--	< 0.05	--
Total iron (Fe)	0.76	16	0.77	43

* Flow rates used in the computation of kg/day (obtained from company totalizer/MOR).
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Pennwalt Chemical Corporation - Wyandotte

Table 1 (continued)

Outfalls	820193 (003)		820223 (005)	
Survey Period From	7-7-80 - 1445		7-7-80 - 1555	
To	7-8-80 - 1445		7-8-80 - 1555	
Computed flow rate* (M^3/day)	(23,200)		4,340	
Highest flow rate (M^3/day)	--		11,900 - 7-8-80 @ 0023	
Lowest flow rate (M^3/day)	--		977 - 7-8-80 @ 0022	
	mg/l	kg/day	mg/l	kg/day
Suspended solids	13	300	27	120
Dissolved solids	390	9,000	16,000	69,000
COD	11	260	Int	--
TOC	2.4	56	1.6	6.9
Phenol	0.007	0.2	< 0.005	--
Nitrite & nitrate nitrogen-N	0.47	11	0.41	1.8
Ammonia nitrogen-N	0.64	15	0.18	0.78
Kjeldahl nitrogen-N	1.1	26	0.33	1.4
Orthophosphates-P	0.06	1	0.02	0.09
Total phosphorus-P	0.17	3.9	0.05	0.2
Chlorides	148	3,430	7,500	33,000
Sulfate (SO_4)	--	--	2,200	9,500
Magnesium (Mg)	--	--	1	4
Sodium (Na)	--	--	6,800	30,000
Calcium (Ca)	--	--	14	61
Total cadmium (Cd)	< 0.02	--	0.04	0.2
Total chromium (Cr)	< 0.05	--	< 0.05	--
Total copper (Cu)	< 0.02	--	0.03	0.1
Total nickel (Ni)	< 0.05	--	< 0.05	--
Total lead (Pb)	0.009	0.2	< 0.005	--
Total zinc (Zn)	< 0.05	--	< 0.05	--
Total iron (Fe)	0.78	18	0.59	2.6
Total mercury (Hg)	--	--	< 0.001	--

* Flow rates used in the computation of kg/day (obtained from company totalizer/MOR).
Int - Interference
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Pennwalt Chemical Corporation - Wyandotte

Table 1 (continued)

Outfalls	821088 (006)		820412 (Intake)
Survey Period From	7-7-80 - 1415		7-7-80 - 1635
To	7-8-80 - 1415		7-8-80 - 1635
Computed flow rate* (M^3/day)	(32,500)		--
	mg/l	kg/day	mg/l
Suspended solids	8	300	6
Dissolved solids	160	5,200	400
COD	37	1,200	9
TOC	15.	490	2.3
Phenol	0.009	0.3	< 0.005
Sulfide (S)	< 0.01	--	--
BOD_5	15.	490	3.5
Nitrite & nitrate nitrogen-N	0.34	11	0.30
Ammonia nitrogen-N	0.46	15	0.27
Kjeldahl nitrogen-N	3.6	120	0.64
Orthophosphates-P	0.01	0.3	0.02
Total phosphorus-P	0.08	3	0.08
Chlorides	21	680	26.
Total cadmium (Cd)	< 0.02	--	< 0.02
Total chromium (Cr)	< 0.05	--	< 0.05
Total copper (Cu)	< 0.02	--	< 0.02
Total nickel (Ni)	< 0.05	--	< 0.05
Total lead (Pb)	< 0.005	--	< 0.05
Total zinc (Zn)	< 0.05	--	< 0.05
Total iron (Fe)	0.57	19	0.52
	ug/l		ug/l
PCB 1242	< 0.1	--	< 0.2
PCB 1254	< 0.1	--	< 0.1
PCB 1260	< 0.1	--	< 0.1

* Flow rates used in the computation of kg/day (obtained from company totalizer/MOR).
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Pennwalt Chemical Corporation - Wyandotte

Table 1 (continued)

Outfall	820409 (South Intake)
Survey Period From	7-7-80 - 1530
To	7-8-80 - 1530
	mg/l
COD	9
TOC	2.2
Phenol	< 0.005
Nitrite & nitrate nitrogen-N	0.30
Ammonia nitrogen-N	0.26
Kjeldahl nitrogen-N	0.56
Orthophosphates-P	0.03
Total phosphorus-P	0.06
Chlorides	13.5
Sulfate (SO_4)	16
Total cadmium (Cd)	< 0.02
Total chromium (Cr)	< 0.05
Total copper (Cu)	< 0.02
Total nickel (Ni)	< 0.05
Total lead (Pb)	< 0.05
Total zinc (Zn)	< 0.05
Total iron (Fe)	0.21

Table 2 (continued)

Date	Time	Ortho-phosphate-P mg/l	Total phosphorus-P mg/l	Chlorides mg/l	Sulfide mg/l	Susp. solids mg/l	Total diss. solids mg/l	Total cadmium mg/l	Total copper mg/l	Total chromium mg/l	Total nickel mg/l
820224 (001)											
7-7-80	2255	0.04	0.09	12.0	--	11	--	--	--	--	--
7-8-80		0.04	0.10	12.5	--	25	--	--	--	--	--
820190 (002)											
7-7-80	2230	0.04	0.14	40.	--	16	210	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	0900	0.05	0.14	37.	--	16	180	0.02	< 0.02	< 0.05	< 0.05
820193 (003)											
7-7-80	2350	0.06	0.15	140	--	13	380	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	0945	0.07	0.17	149	-	14	410	< 0.02	< 0.02	< 0.05	< 0.05
820223 (005)											
7-7-80	2400	0.02	0.04	5,400	--	6	12,000	0.03	0.02	< 0.05	< 0.05
7-8-80	1010	0.03	0.07	8,500	--	19	20,000	0.04	0.04	< 0.05	< 0.05
821088 (006)											
7-7-80	2120	< 0.01	0.08	18.0	< 0.01	13	140	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	1000	0.02	0.10	21	< 0.01	11	160	< 0.02	< 0.02	< 0.05	< 0.05
820412 (North Intake)											
7-7-80	2215	0.03	0.07	14.7	--	--	--	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	0845	0.03	0.09	13.1	--	--	--	< 0.02	< 0.02	< 0.05	< 0.05
820409 (South Intake)											
7-7-80	1550	--	--	--	--	16	130	--	--	--	--
7-8-80	1115	--	--	--	--	16	140	--	--	--	--

-10-

Pennwalt Chemical Corporation - Wyandotte

Table 2 Analyses of grab samples.

Date	Time	Temp.[1] °C	pH[1] S.U.	Residual[1] Chlorine mg/l	O&G I.R. mg/l	O&G Grav. mg/l	COD mg/l	TOC mg/l	Phenol mg/l	BOD_5 mg/l	Nitrite & nitrate nitrogen mg/l	Ammonia nitrogen mg/l	Kjeldahl nitrogen mg/l
820224 (001)													
7-7-80	2255	23.5	7.7	U	--	--	8	2.3	--	--	0.36	0.20	0.44
7-8-80	0825	24.0	7.7	U	--	--	10	3.0	--	--	0.35	0.26	0.58
820190 (002)													
7-7-80	2230	33.5	7.8	T	1	< 2	7	2.2	--	--	0.43	0.22	0.51
7-8-80	0900	34.0	8.0	0.3	1	< 2	18	2.7	--	--	0.33	0.30	0.71
820193 (003)													
7-7-80	1430	--	--	1.05	--	--	--	--	--	--	--	--	--
7-7-80	2350	26.0	7.7	1.10	2	< 2	11	2.4	--	--	0.46	0.61	1.0
7-8-80	0945	26.5	8.0	0.90	1	< 2	13	2.6	--	--	0.45	0.68	1.1
820223 (005)													
7-7-80	2400	27.0	7.9	U	< 1	< 2	Int.	1.4	--	--	0.32	0.15	0.44
7-8-80	1010	30.0	8.0	U	< 1	< 2	Int.	1.9	--	--	0.34	0.24	0.92
821088 (006)													
7-7-80	2120	28.0	8.6	U	9	14	45	11.	< 0.005	13.	0.35	0.38	1.4
7-8-80	1000	29.0	8.7	U	3	2	32	6.6	0.021	8.8	0.38	0.55	1.5
820412 (North Intake)													
7-7-80	2215	21.5	7.7	--	1	< 2	10	2.3	--	3.3	0.30	0.25	0.49
7-8-80	0845	22.0	7.7	--	4	2	11	2.8	--	4.8	0.29	0.33	0.63
820409 (South Intake)													
7-7-80	1550	20.0	8.0	T	< 1	< 2	11	2.3	--	--	--	--	--
7-8-80	0745	20.5	7.6	T	--	--	--	--	--	--	--	--	--
7-8-80	1115	20.5	8.0	T	< 1	< 2	10	2.6	--	--	--	--	--

1 - Values determined in the field at time of sampling.
U - Undetected
T - Trace amount present - actual concentration less than 0.2 which is the quantifiable amount.
Int. - Interference

-9-

Table 2 (continued)

Date	Time	Total Lead ug/l	Total Zinc mg/l	Total Iron mg/l	Total Mercury ug/l	A-1242 PCB ug/l	A-1254 PCB ug/l	A-1260 PCB ug/l	HCB ug/l	DCP ug/l	HCBD ug/l	DCB ug/l	PCP ug/l	2,4,6,-TCP ug/l
820190 (002)														
7-7-80	2230	< 0.05	< 0.05	0.65	--	--	--	--	< 0.1	< 0.1	< 0.1	< 0.1	T	T
7-8-80	0900	< 0.05	< 0.05	0.91	--	--	--	--	< 0.1	< 0.1	< 0.1	< 0.1	T	< 0.1
820193 (003)														
7-7-80	2350	0.01	< 0.05	0.70	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
7-8-80	0945	0.014	< 0.05	0.84	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	T	< 0.1
820223 (005)														
7-7-80	2400	< 0.005	< 0.05	0.35	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	T	0.1
7-8-80	1010	< 0.005	< 0.05	1.0	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	T	0.1
821088 (006)														
7-7-80	2120	< 0.005	< 0.05	0.50	--	--	--	--	--	--	--	--	--	--
7-8-80	1000	< 0.005	< 0.05	0.76	--	--	--	--	--	--	--	--	--	--
820412 (North Intake)														
7-7-80	2215	< 0.05	0.10	0.54	--	--	--	--	--	--	--	--	--	--
7-8-80	0845	< 0.05	< 0.05	0.34	--	--	--	--	--	--	--	--	--	--

	Persistant Chlorinated Hydrocarbons ug/l	1,2, Di Chlorinated Propane ug/l	Chloroform ug/l	Aliphatic amines ug/l	HCP ug/l	Other Cl-Phenols ug/l	Other Cl + Br VHC ug/l
820190 (002)							
7-7-80 2230	U	33	3	--	< 0.1	U	U
7-8-80 0900	U	33	3	--	< 0.1	U	U
820193 (003)							
7-7-80 2350	U	13	4	--	< 0.1	U	U
7-8-80 0945	U	10	5	--	< 0.1	U	U
820223 (005)							
7-7-80 2400	U	6	4	--	< 0.1	U	U
7-8-80 1010	U	7	8	--	< 0.1	U	U
821088 (006)							
7-8-80 1000	--	--	--	< 100			
7-8-80 1405	--	--	--	< 100			

T - Trace amount present-actual concentration less than 0.2 which is the quantifiable amount.
HCB - Hexachlorobenzene HCBD - Hexachlorobutadiene TCP - Trichlorophenol
HCP - Hexachlorocyclopentadine DCB - Dichlorobenzidene PCB - Polychlorinated biphenyls
DCP - Dichlorophenol PCP - Pentachlorophenol

Table 3 Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report.

Parameter (Unit)	NPDES Permit Final Limitations Daily Average	NPDES Permit Final Limitations Daily Maximum	July Monthly Operating Report Monthly Average	July Monthly Operating Report Monthly Maximum	7-7-80	7-8-80	Survey Results[1]
820409 (Intake)							
Suspended solids (mg/l)	--	--	70	115	60	52	(16, 16)
Chlorides (mg/l)	--	--	18	24	--	16	13.5
COD (mg/l)	--	--	24	49	32	--	9 (11, 10)
Total iron (mg/l)	--	--	2.31	2.78	--	--	0.21
BOD_5 (mg/l)	--	--	3	4	--	1	--
820224 (001)							
Flow (M^3/day)	--	--	24,000	27,000	22,000	22,000	21,500
Suspended solids (mg/l)	--	--	30	68	--	13	14 (11, 25)
Ammonia nitrogen (mg/l)	--	--	0.10	0.25	0.25	--	0.23 (0.20, 0.26)
Chlorides (mg/l)	--	--	17	19	18	--	(12.0, 12.5)
COD (mg/l)	--	--	12	17	--	17	7 (8, 10)
pH (S.U.)	not <6.5 nor >9.5		min. 7.7	8.1	7.8	--	(7.7, 7.7)
Residual chlorine (mg/l)	--	--	0.0	0.0	--	0.0	(U, U)
Temperature (°C)	--	--	18	30	--	15	(23.5, 24.0)
820190 (002)							
Flow (M^3/day)	--	--	56,400	62,100	55,300	56,400	55,400
Total suspended solids (kg/day)	844	1,687	1,833	9,543	9,543	507	830
Ammonia nitrogen (mg/l)	1.4	2.3	0.12	0.75	--	--	0.24 (0.22, 0.30)
Chlorides (mg/l)	--	--	30	52	--	31	36. (40., 37)
COD (mg/l)	--	--	22	71	71	--	9 (7, 18)
Total lead (kg/day)	0.6	1.25	0.36	0.467	--	--	--
Residual chlorine (mg/l)	1.0	1.5	0.13	0.82	0.30	0.00	(T, 0.3)
Temperature (°C)	--	--	34	37	33	33	(33.5, 34.0)
pH (S.U.)	not <6.5 nor >9.5		--	10.6 High min. 6.6 Low	10.2 High 7.0 Low	9.6 High 7.4 Low	(7.8, 8.0)

1 - Survey results are for the composite sample. Grab sample ranges are shown in parentheses ( ).
T - Trace
U - Undetected
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Table 3 Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report (continued).

Parameter (Unit)	NPDES Permit Final Limitations		July Monthly Operating Report				Survey Results[1]
	Daily Average	Daily Maximum	Monthly Average	Monthly Maximum	7-7-80	7-8-80	
820193 (003)							
Flow (M^3/day)	--	--	23,700	25,000	23,000	23,000	(23,200)
Total susp. solids (kg/day)	384	768	483	877	415	399	303
Ammonia nitrogen (mg/l)	3	5	0.08	0.88	--	0.88	0.64 (0.61, 0.68)
Total copper (mg/l)	--	1.0	0.016	0.035	0.011	--	< 0.02 (<0.02, <0.02)
Total lead (kg/day)	0.45	0.9	0.34	0.476	--	--	0.2
Total iron (mg/l)	--	1.6	1.733	2.060	--	--	0.78 (0.70, 0.84)
Residual chlorine (mg/l)	1.0	1.5	0.18	0.85	0.14	0.70	(1.05, 1.10, 0.90)
Chlorides (mg;l)	--	--	146	167	--	149	148 (140, 149)
Temperature (°C)	--	--	27	32	26	26	(26.0, 26.5)
pH (S.U.)	not <6.5 nor >9.5		--	10.0 min. 6.4	High 8.7 Low 7.9	High 8.5 Low 7.1	(7.7, 8.0)
820223 (005)							
Flow (M^3/day)	--	--	6,800	7,600	6,100	6,100	4,340
Total susp. solids (mg/l)	35	70	30	358	7	10	27 (6, 19)
Total susp. solids (kg/day)	212	425	200.	2,434	42	60	120
COD (kg/day)	--	821	59	221	130	--	Int.
Ammonia nitrogen (mg/l)	1.0	1.5	0.36	1.38	--	0.62	0.18 (0.15, 0.24)
Chlorides (mg/l)	--	--	6,836	9,372	--	7,480	7,500 (5,400, 8,500)
Total lead (mg/l)	0.1	0.2	0.008	0.010	--	--	< 0.005 (<0.005, <0.005)
Total lead (kg/day)	0.6	1.2	0.050	0.054	--	--	--
Temperature (°C)	--	--	27	31	20	27	(27.0, 30.0)
Residual chlorine (mg/l)	1.0	1.5	0.00	0.05	0.00	0.00	(U, U)
pH (S.U.)	not <6.5 nor >9.5		--	12.4 min. 2.7	High 8.8 Low 7.8	High 8.6 Low 7.5	(7.9, 8.0)

1 - Survey results are for the composite sample. Grab sample ranges are shown in parentheses ( ).
Int - Interference
U - Undetected
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Table 3 Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report. (continued)

Parameter (Unit)	NPDES Permit Final Limitations		July Monthly Operating Report				Survey Results[1]
	Daily Average	Daily Maximum	Monthly Average	Monthly Maximum	7-7-80	7-8-80	
821088 (006)							
Flow (M^3/day)	--	--	26,000	33,000	33,000	32,000	32,500
BOD_5 (kg/day)	173	259	146	606	--	95	490
COD (mg/l)	--	--	13	36	--	16	37 (45, 32)
Total susp. sol.-net (kg/day)	173	259	1,778	2,270.	--	1,650	--
Chlorides-net (kg/day)	--	4,000	260.	722	--	223	160
Ammonia nitrogen (mg/l)	1.5	3.0	0.42	1.80	0.30	--	0.46 (0.38, 0.55)
Ammonia nitrogen (kg/day)	--	114	12.6	58.47	9.75	--	15
Phenol (mg/l)	--	0.2	0.02	0.02	--	0.02	0.009 (<0.005, 0.021)
Phenol (kg/day)	--	4.5	0.508	0.671	--	0.649	0.3
Sulfide (mg/l)	--	--	0.0	0.0	--	--	< 0.01
Total zinc (mg/l)	--	1.0	0.015	0.020	--	--	< 0.05
Temperature (°C)	--	--	26	28	26	--	(28.0, 29.0)
Residual chlorine (mg/l)	--	0.5	0.01	0.10	0.00	--	(U, U)
pH (S.U.)	not <6.5 nor >9.5		--	9.5 min. 7.2	High 8.6 Low 7.7	High 8.2 Low 7.6	(8.6, 8.7)
Total Combined Outfalls							
Chlorides (kg/day)	--	227,000	44,800	63,900	--	49,100	38,000

1 - Survey results are for the composite sample. Grab sample ranges are shown in parentheses ( ).
U - Undetected
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Table 4 Comparison of the laboratory analytical results obtained by Pennwalt Chemical Corporation - Wyandotte and the Environmental Protection Bureau from the split composite samples.

Outfalls	820224 (001)		820190 (002)	
	Pennwalt mg/l	E.P.B. mg/l	Pennwalt mg/l	E.P.B. mg/l
Suspended solids	16.0	14	14.7	15
Ammonia nitrogen	0	0.23	0	0.24
COD	1.0	7	7.0	9
Chlorides	--	--	39.5	36
Lead (Pb)	--	--	0.00309	< 0.05

Outfalls	820193 (003)		820223 (005)	
	Pennwalt mg/l	E.P.B. mg/l	Pennwalt mg/l	E.P.B. mg/l
Suspended solids	17.5	13	17.5	27
Ammonia nitrogen-N	0	0.64	0	0.18
COD	--	--	5.2	Interference
Chlorides	149.5	148	7,117.4	7,500
Copper	0.006903	<0.02	--	--
Lead	0.00456	0.009	0.0124	< 0.005
Iron	0.77	0.78	--	--

	821088 (006)		820412 (Intake)	
	Pennwalt mg/l	E.P.B. mg/l	Pennwalt mg/l	E.P.B. mg/l
Suspended solids	3.5	8	8.7	6
Ammonia nitrogen-N	0.7	0.46	--	--
COD	15.2	15	3.6	3.5
[illegible]	36.0	37	10.9	9
Chlorides	25.2	21	48.1	26
Cyanide	0	< 0.01	--	--
[illegible]	< 0.020	0.009	--	--
[illegible]	0.021	< 0.05	--	--
Iron	--	--	0.37	0.52

Pennwalt Chemical Corporation - Wyandotte

Table 5 Comparison of the previous survey results with the results obtained in this survey.

Outfalls		820224 (001)		820190 (002)	
Survey Date	From	11-6-78	7-7-80	11-6-78	7-7-80
	To	11-7-78	7-8-80	11-7-78	7-8-80
Flow Rate (M^3/day)		19,000	21,500	42,500	55,400
		mg/l	mg/l	mg/l	mg/l
Suspended solids		25	14	14	15
Dissolved solids		170	160	200	200
COD		26	7	9	9
Phenol		< 0.01	0.007	0.03	< 0.005
Nitrite & nitrate nitrogen-N		0.35	0.36	0.32	0.32
Ammonia nitrogen-N		0.39	0.23	0.32	0.24
Total phosphorus-P		0.22	0.07	0.07	0.09
Chlorides		--	--	30	36
Total lead (Pb)		--	--	< 0.005	< 0.05
Total zinc (Zn)		--	--	0.048	< 0.05
Total iron (Fe)		1.3	0.76	0.72	0.77

Pennwalt Chemical Corporation - Wyandotte

Table 5 (continued)

Outfalls	820193 (003)		820223 (005)	
Survey Date From	11-6-78	7-7-80	11-6-78	7-7-80
To	11-7-78	7-8-80	11-7-78	7-8-80
Flow Rate (M^3/day)	22,400	23,200	4,700	4,340
	mg/l	mg/l	mg/l	mg/l
Suspended solids	19	13	32	27
Dissolved solids	390	390	64,000	16,000
COD	14	11	20	Interference
Oil	< 0.01	0.007	< 0.01	< 0.005
Nitrite & nitrate nitrogen-N	0.38	0.47	0.71	0.41
Ammonia nitrogen-N	2.9	0.64	0.65	0.18
Total phosphorus-P	0.16	0.17	0.22	0.05
Chlorides	136	148	32,000	7,500
Total chromium (Cr)	--	--	0.006	< 0.05
Total copper (Cu)	0.020	< 0.02	0.003	0.03
Total nickel (Ni)	--	--	--	--
Total lead (Pb)	0.009	0.009	< 0.005	< 0.005
Total zinc (Zn)	--	--	< 0.005	< 0.05
Total iron (Fe)	1.2	0.78	0.017	0.59

Pennwalt Chemical Corporation - Wyandotte

Table 5 (Continued)

Outfalls	821088 (006)		820412 (Intake)	
Survey Date From	11-6-78	7-7-80	11-6-78	7-7-80
To	11-7-78	7-8-80	11-7-78	7-8-80
Flow Rate (M^3/day)	29,000	32,500	--	--
	mg/l	mg/l	mg/l	mg/l
Suspended solids	15	8	12	6
Dissolved solids	570	160	160	400
COD	47	37	10	9
Phenol	0.15	0.009	--	--
Sulfide (S)	0.05	< 0.01	--	--
BOD_5	33	15	4.3	3.5
Nitrite & nitrate nitrogen-N	0.33	0.34	0.28	0.30
Ammonia nitrogen-N	0.65	0.46	0.39	0.27
Total phosphorus-P	0.10	0.08	0.07	0.08
Chlorides	28	21	22	26
Total lead (Pb)	< 0.005	< 0.005	--	--
Total zinc (Zn)	0.040	< 0.05	0.009	< 0.05
Total iron (Fe)	9.2	0.57	0.31	0.52

Figure 1 Pennwalt Corporation - East Plant

Process Flow Diagram

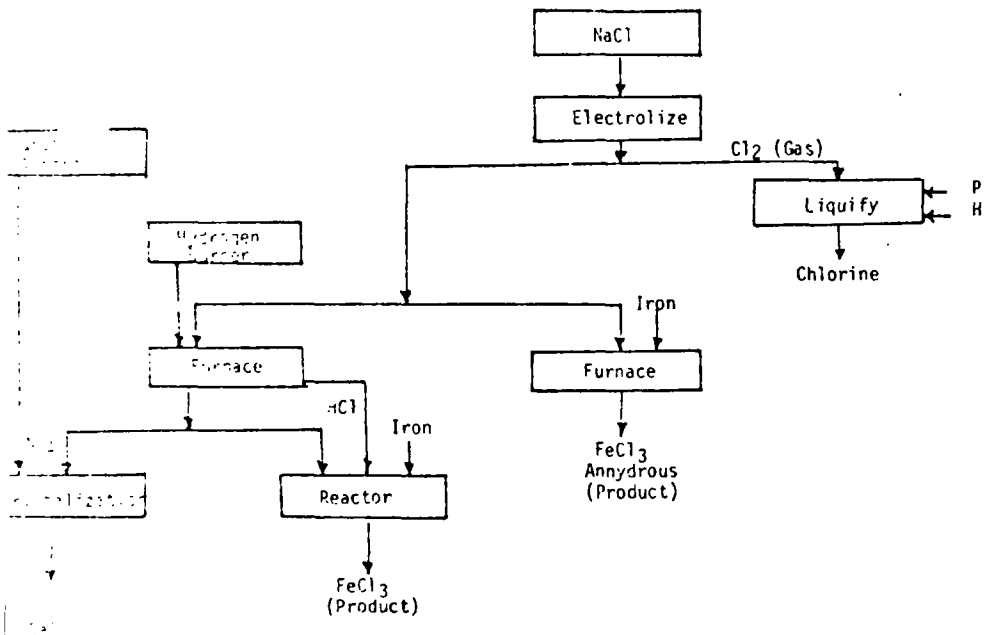


Table 6 Sample Preservation

Parameter	Preservative
COD/TOC/phenol (Chlorine absent)	10 drops conc. H_2SO_4/250 ml (to pH <2).
Phenols (Chlorine present)	Dechlorinated w/ferrous ammonium sulfate (0.141 N) 1 drop/mg/l Cl_2/250 ml. H_2SO_4 to pH <2.
Total Metals	2 ml 1:1 HNO_3/250 ml (to pH <2).
Oil & Grease	10 drops conc. H_2SO_4/250 ml (to pH <2).
Sulfides	10 drops 1M ZnAc/250 ml.
& base-neutral extractables	Dechlorinated (if needed) with sodium thiosulfate (1 drop 0.141 N/mg/l Cl_2/250 ml).

All samples cooled to 4°C and preserved upon collection and chain of custody maintained.

Survey by: Gary Boersen, Environmental Engineer
Elizabeth Browne, Water Quality Technician
William Erickson, Water Quality Technician
Guntis Kalejs, Water Quality Technician
Bruce Walker, Water Quality Technician

Contact with Management: John Lewis, Supervisor of Environmental Control & Certified Operator
Tom Overgaard, Senior Chemist - East Plant
Chuck Talcot, Lab Supervisor - West Plant

Hydrocarbon Analyses by: Environmental Protection Bureau Laboratory

Physical, Chemical & Bacteriological Analyses by: Environmental Protection Bureau Laboratory

Report by: Gary Boersen
William Erickson
Point Source Studies Section
Environmental Services Division
Environmental Protection Bureau
Michigan Dept. of Natural Resources

Distribution "A"

...ion/Branch EASTERN Sampling Date 4-5 NOV 1980 Lab Arrival Date 20 11 80 Analysis Due Date 1 15
Day Month Year Day Month Year Day Month
. Number B 3 3 3 Activity C S T - T Study PENNWALT-CO
11-24-80

81102 582 12-3 1245

...ter No.	00630	00610	00625	00605	00665	00666	00340	00680	71900
Sample Number	Nitrate + Nitrite As N	Ammonia as N	Total Kjeldahl Nitrogen	Organic Nitrogen	Total P	Dis. P.	COD	TOC	Total Mercury
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l
S01 ✓	—	0.31					✓ 62		
S04 ✓	—	0.28					✓ 48		
S07 ✓	—	3.06					✓ 50		
S10 ✓	—	0.42					✓ 947		
S13 ✓	—	0.49					✓ 41		
S16 ✓	—	0.32					✓ 30		
D19 ✓	—	0.33					✓ 26		
[illegible] ✓	—	—					✓ —		
[illegible] ✓	—	—					✓ —		
[illegible] ✓	—	—					✓ —		
[illegible] ✓	—	0.65					✓ 19		
B33 ✓	—	K0.03					✓ 3		
		12/31/80					12-4-80		
							8		
							OK 1/9/81		

Code 4-9 ... Lab attach reading error 1023 reading higher.

U.S. ENVIRONMENTAL PROTECTION AGENCY
EASTERN DISTRICT OFFICE
FIELD SAMPLING SURVEY PROPOSAL

FACILITY NAME *Pennwalt Corp* LOCATION *Riverview* SURVEY DATE *11/3/80*

NPDES NO. *MI 0002381*

SURVEY NO. 81 *ELO2*

Sample Number	Sample Point	Sample Point Description	FIELD: TEMP.	FIELD: PH	FIELD: D.O.	FIELD: COND.	FIELD: CHLORINE	FIELD: FLOW	DISTRICT LAB: PH	COND.	BOD	TOT. SOLIDS	DIS. SOLIDS	SUSP. SOLIDS	HEX. CHORME	O & G	PHENOL	CYANIDE	CN-A	TOT. COLI.	FEC. COLI.
ELO2		Preservative Code							01	01	01	01	01	01	01	06	09	10	10	00	00
S01	001	Niton SS	2/G	2/G		2/C	2/G	24/C	✓	✓				24/C		2/G					
S02	002	Aimes & Bio #3	2/G	2/G		2/G	2/G	24/C	✓	✓				24/C		2/G					
S03	003	Aimes & Bio #2	2/G	2/G		2/G	2/G	24/C	✓	✓				24/C		2/G					
S04	005		2/G	2/G		2/G	2/G	24/C	✓	✓				24/C		2/G					
S05	006	Aimes & Bio #1	2/G	2/G		2/G	2/G	24/C	✓	✓	24/C			24/C		2/G	24/C				
S06	INF		2/G	2/G		2/G	2/G	✓/C	✓	✓	24/C			✓/C		2/G	C				
S07		Influent to Pond #1	2/G	2/G		2/G	2/G	G	✓	✓				24/C			C				
S08		" " " #1	2/G	2/G		2/G	2/G	G	✓	✓				C			C				
S09		" " " #2	2/G	2/G		2/G	2/G	G	✓	✓				C			C				
S10		" " Pond #4	2/G	2/G		2/G	2/G	C	✓	✓				C			C				
S11		Monguagon Creek sludge															✓				

Sample Number	CENTRAL REGIONAL LAB: CHLORIDE	FLUORIDE	SULFATE	SULFIDE	NH3	NO_2+NO_3	TKN	TOT. P.	COD	TOC	PLASMA	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn	Hg	P.C.B.	PESTICIDE	B.N.C.	AMES	BIO ASS.	VOA	Dioxin/[illegible]
Preservative Code	01	01	01	01	04	04	04	04	04	04	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07 (08)	07A	03	03	03	03	03		
S01	C				C				C		C											C	✓	✓	✓	✓	✓	✓	✓
S02	C				C				C		C											C	✓	✓	✓	✓	✓	✓	✓
S03	C				C				C		C					C	C	C				C	✓	✓	✓	✓	✓	✓	✓
S04	C				C				C		C																		
S05	C			2/G	C				C		C										C	C	✓	✓	✓	✓	✓	✓	✓
S06	C				C						C						C												
S07	C			2/G	C				C		C												✓	✓	✓			✓	✓
S08	C			2/G	C				C		C												✓	✓	✓			✓	✓
S09	C			2/G	C				C		C												✓	✓	✓			✓	✓
S10	C			3/G	C				C		C												✓	✓	✓			✓	✓
S11											✓												✓	✓	✓			✓	

Division/Branch [illegible] Sampling Date 25 NOV 1980 Lab Arrival Date
Day Month Year Day Month Year

D.U. Number B 501 Activity E31-7 PSEUNWALT-CC

81EL03 582 12-1-80AS

Parameter No.		00976	00530	70300	00095	00945	00940	00956	00410
CRL Sample Log Number		Turbidity	Sus. Solids (105°C)	Dissolved Solids (180°C)	Specific Conductance	Sulfate	Chloride	Total Silica as SiO_2	Alkalinity as $CaCO_3$
Units		Formazin Turb. Units	mg/l	mg/l	µmhos/cm at 25°	mg/l	mg/l	mg/l	mg/l
1	S01						✓ 11		
2	S04						✓ 23		
3	S07						✓ 130		
4	S10						✓ 5600		
5	S13						✓ 15		
6	S16						✓ 14		
7	DL9						✓ 12		
8	[illegible]						✓ —		
9	[illegible]						✓ —		
10	[illegible]						✓ —		
11	S29						✓ 13		
12							kc		
13							11/26/80		
14									
15									
16									
17		Code 1 - Sample stored receiving room - 1029 refrigerator.							
18									
19									
20									

ion/Branch "EASTERN" Sampling Date 4-5 NOV 1980 (Day Month Year) Lab Arrival Date 20 11 80 (Day Month Year) Analysis Due Date 1/5/81 (Day Month)

Number E303 Activity E31-7 Study PENNWALT CU

1EL02 Dup. of S12 2-9-81 AJ Jan 11-24-80 CK 12/12/80

meter No.	01105	01002	01007	01027	01034	01037	01042	01045	01051	01055		
RL Sample og Number	Total Aluminum	Total Arsenic	Total Barium	Total Cadmium	Total Chromium	Total Cobalt	Total Copper	Total Iron	Total Lead	Total Manganese	PLASMA	HG
Units	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l		ug/l
S01											✓	✓ K0.1
S04											✓	✓ K0.1
7											✓	✓ 0.4
S10											✓	✓
S13								✓			✓	✓ 12/9/8
S16								✓			✓	
D19								✓			✓	
[illegible]											✓	
[illegible]											✓	
[illegible]											✓	
S25											✓	
Time 2												

Code 7 - 8 samples stored receiving room 1029 refrigerator.

12/15/80 CTF

ENVIRONMENTAL PROTECTION AGENCY, REGION V, CRL

PENNWALT

EDO DATA S

ET NO. 582

12-12-80

Jun 15 Dec. 80

PARAMETER #	00916	00927	00929	01077	01105	01022	01007	01012	01027	01037
SAMPLE ID.	CA	MG	NA	AG	AL	B	BA	BE	CD	CO
UNITS	MG/L	MG/L	MG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02501	28.3	7.3	6.7	K 3	115	N.A.	17	K 1	K 2	K 5
4	27.6	7.2	18.6	K 3	192	N.A.	18	K 1	K 2	K 5
7	27.5	7.4	71.5	K 3	221	N.A.	18	K 1	K 2	K 5
13	27.5	7.0	8.1	K 3	94	N.A.	16	K 1	K 2	K 5
16	27.4	7.2	7.1	K 3	118	N.A.	16	K 1	K 2	K 5
D19	28.3	7.4	6.7	K 3	148	N.A.	17	K 1	K 2	K 5
29	27.4	7.1	8.1	K 3	148	N.A.	17	K 1	K 2	K 5

PARAMETER #	01034	01042	01045	01055	01062	01067	01051	01102	01152	01087
SAMPLE ID.	CR	CU	FE	MN	MO	NI	PB	SN	TI	V
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02501	K 5	K 6	400	9	K 10	K 30	K 30	N.A.	7	K 5
4	K 5	K 6	648	13	K 10	K 30	K 30	N.A.	10	K 5
7	K 5	K 6	883	23	K 10	K 30	K 30	N.A.	10	K 5
13	K 5	K 6	495	9	K 10	K 30	K 30	N.A.	9	K 5
16	K 5	K 6	368	15	K 10	K 30	K 30	N.A.	13	K 5
D19	K 5	K 6	418	11	K 10	K 30	K 30	N.A.	8	K 5
29	K 5	K 6	602	16	K 10	K 30	K 30	N.A.	8	K 5

PARAMETER #	01203	01092	
SAMPLE ID.	Y	ZN	12
UNITS	UG/L	UG/L	UG/L
EL02501	K 5	K 50	N.A.
4	K 5	K 50	N.A.
7	K 5	K 50	N.A.
13	K 5	K 50	N.A.
16	K 5	K 50	N.A.
D19	K 5	K 50	N.A.
29	K 5	K 50	N.A.

ENVIRONMENTAL PROTECTION AGENCY, REGION V, CRL

EDO DATA S

12-12-80

ET NO. 582

PARAMETER #	00916	00927	00929	01077	01105	01022	01007	01012	01027	01037
SAMPLE ID.	CA	MG	NA	AG	AL	B	BA	BE	CD	CO
UNITS	MG/L	MG/L	MG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02510	K50	K1.0	3790	K 30	K900	N.A.	K 50	K 10	K 20	K 50

PARAMETER #	01034	01042	01045	01055	01062	01067	01051	01102	01152	01087
SAMPLE ID.	CR	CU	FE	MN	MO	NI	PB	SN	TI	V
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02510	K 50	K 60	K1200	K 50	K100	K300	K300	N.A.	K 60	K 50

PARAMETER #	01203	01092	
SAMPLE ID.	Y	ZN	12
UNITS	UG/L	UG/L	UG/L
EL02510	K 50	K500	N.A.

12/15/80 dlg

ENVIRONMENTAL PROTECTION AGENCY, REGION V, CRL — SLUDGE

EDO DATA

SET NO. 582

12-12-80

PARAMETER #	00916	00927	00929	01077	01105	01022	01007	01012	01027	01037
SAMPLE ID.	CA	MG	NA	AG	AL	B	BA	BE	CD	CO
UNITS	MG/G	MG/G	MG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G
EL02532	120.0	17.8	K1.2	7	13000	N.A.	170	2	9	11

PARAMETER #	01034	01042	01045	01055	01062	01067	01051	01102	01152	01087
SAMPLE ID.	CR	CU	FE	MN	MO	NI	PB	SN	TI	V
UNITS	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G
EL02532	230	140	35000	780	37	140	540	N.A.	210	44

PARAMETER #	01203	01092	
SAMPLE ID.	Y	ZN	12
UNITS	UG/G	UG/G	UG/G
EL02532	20	2700	N.A.

Division/Branch [illegible] Sampling Date 19 NOV 1980 Lab Arrival Date
Day Month Year Day Month Year

D.U. Number 1 B 501 Activity E31-7

81EL08 582

12-1-80 AS

PSEP NWALT CO

Parameter No.		00076	00530	70300	00095	00945	00940	00956	00410
CRL Sample Log Number		Turbidity	Sus. Solids (105°C)	Dissolved Solids (180°C)	Specific Conductance	Sulfate	Chloride	Total Silica as SiO_2	Alkalinity as $CaCO_3$
Units		Formazin Turb. Units	mg/l	mg/l	µmhos/cm at 25°	mg/l	mg/l	mg/l	mg/l
1	S01						✓ 11		
2	S04						✓ 23		
3	S07						✓ 130		
4	S10						✓ 5600		
5	S13						✓ 15		
6	S16						✓ 14		
7	D19						✓ 12		
8	[illegible]						✓ —		
9	[illegible]						✓ —		
10	[illegible]						✓ —		
11	S29						✓ 13		
12							KL		
13							11/26/80		
14									
15									
16									
17		Code 1 - Samples stored receiving room 1029 refrigerator.							
18									
19									
20									

sion/Branch "EASTERN" Sampling Date 4-5 NOV 1980 (Day Month Year) Lab Arrival Date 20 11 80 (Day Month Year) Analysis Due Date 1/15/81 (Day Month Year)

. Number B303 Activity C3C-7 Study PENNWALT PCB

1EL02 Data set 582 2-9-81 AJ Rec 11-24-80 CK 12/3/80

ameter No.	01105	01002	01007	01027	01034	01037	01042	01045	01051	01055		
CRL Sample Log Number	Total Aluminum	Total Arsenic	Total Barium	Total Cadmium	Total Chromium	Total Cobalt	Total Copper	Total Iron	Total Lead	Total Manganese	PLASMA	HC
Units	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l		ug/l
501											✓	✓ Ko.
504											✓	✓ Ko.
17											✓	✓ 0.4
510											✓	✓
513								✓			✓	✓ 12/8/
516								✓			✓	✓
519								✓			✓	✓
[illegible]											✓	
[illegible]											✓	
[illegible]											✓	
529											✓	
2												

Code 7 - 8 samples stored receiving room 1029 refrigerator.

ENVIRONMENTAL PROTECTION AGENCY, REGION V BASIC DATA FORM

ion/Branch EASTERN Sampling Date 4-5 NOV 1980 (Day Month Year) Lab Arrival Date 20 11 80 (Day Month Year) Analysis Due Date 1 15 (Day Month)

. Number B 393 Activity CST-T Study PENNWALT-CO

81 02 582 10-31 80 AT

ter No.	00630	00610	00625	00605	00665	00666	00340	00680	71900
Sample Number	Nitrate + Nitrite As N	Ammonia as N	Total Kjeldahl Nitrogen	Organic Nitrogen	Total P	Dis. P.	COD	TOC	Total Mercury
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l
501 ✓	—	0.31					✓ 62		
502 ✓	—	0.28					✓ 48		
503 ✓	—	3.06					✓ 50		
510 ✓	—	0.42					✓ 947		
513 ✓	—	0.49					✓ 41		
516 ✓	—	0.32					✓ 30		
519 ✓	—	0.33					✓ 26		
[illegible] ✓	—	—					✓ —		
[illegible] ✓	—	—					✓ —		
[illegible] ✓	—	—					✓ —		
5[illegible] ✓	—	0.65					✓ 19		
533 ✓	—	K0.03					✓ 3		
		12/31/80					12-480		
							82		
							OR 1/9/81		

Code 4-9 [illegible] Lee Street meeting room 1627 Wilmington.

12/15/80 CM

PENNWALT

ENVIRONMENTAL PROTECTION AGENCY, REGION V, CRL

EDO DATA 8

ET NO. 582

12-12-80

Jun 15 Dec 80

PARAMETER #	00916	00927	00929	01077	01105	01022	01007	01012	01027	01037
SAMPLE ID.	CA	MG	NA	AG	AL	B	BA	BE	CD	CO
UNITS	MG/L	MG/L	MG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02501	28.3	7.3	6.7	K 3	115	N.A.	17	K 1	K 2	K 5
4	27.6	7.2	18.6	K 3	192	N.A.	18	K 1	K 2	K 5
7	27.5	7.4	71.5	K 3	221	N.A.	18	K 1	K 2	K 5
13	27.5	7.0	8.1	K 3	94	N.A.	16	K 1	K 2	K 5
16	27.4	7.2	7.1	K 3	118	N.A.	16	K 1	K 2	K 5
D19	28.3	7.4	6.7	K 3	148	N.A.	17	K 1	K 2	K 5
29	27.4	7.1	8.1	K 3	148	N.A.	17	K 1	K 2	K 5

PARAMETER #	01034	01042	01045	01055	01062	01067	01051	01102	01152	01087
SAMPLE ID.	CR	CU	FE	MN	MO	NI	PB	SN	TI	V
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02501	K 5	K 6	400	9	K 10	K 30	K 30	N.A.	7	K 5
4	K 5	K 6	648	13	K 10	K 30	K 30	N.A.	10	K 5
7	K 5	K 6	883	23	K 10	K 30	K 30	N.A.	10	K 5
13	K 5	K 6	495	9	K 10	K 30	K 30	N.A.	9	K 5
16	K 5	K 6	368	15	K 10	K 30	K 30	N.A.	13	K 5
D19	K 5	K 6	418	11	K 10	K 30	K 30	N.A.	8	K 5
29	K 5	K 6	602	16	K 10	K 30	K 30	N.A.	8	K 5

PARAMETER #	01203	01092	
SAMPLE ID.	Y	ZN	12
UNITS	UG/L	UG/L	UG/L
EL02501	K 5	K 50	N.A.
4	K 5	K 50	N.A.
7	K 5	K 50	N.A.
13	K 5	K 50	N.A.
16	K 5	K 50	N.A.
D19	K 5	K 50	N.A.
29	K 5	K 50	N.A.

12/15/80 ltr

ENVIRONMENTAL PROTECTION AGENCY, REGION V, CRL

EDO DATA S ET NO. 582

12-12-80

PARAMETER #	00916	00927	00929	01077	01105	01022	01007	01012	01027	01037
SAMPLE ID.	CA	MG	NA	AG	AL	B	BA	BE	CD	CO
UNITS	MG/L	MG/L	MG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02510	K50	K1.0	3790	K 30	K900	N.A.	K 50	K 10	K 20	K 50

PARAMETER #	01034	01042	01045	01055	01062	01067	01051	01102	01152	01087
SAMPLE ID.	CR	CU	FE	MN	MO	NI	PB	SN	TI	V
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
EL02510	K 50	K 60	K1200	K 50	K100	K300	K300	N.A.	K 60	K 50

PARAMETER #	01203	01092	
SAMPLE ID.	Y	ZN	12
UNITS	UG/L	UG/L	UG/L
EL02510	K 50	K500	N.A.

12/10/80 CM

ENVIRONMENTAL PROTECTION AGENCY, REGION V, CRL SLUDGE

EDO DATA

SET NO. 582

12-12-80

PARAMETER #	00916	00927	00929	01077	01105	01022	01007	01012	01027	01037
SAMPLE ID.	CA	MG	NA	AG	AL	B	BA	BE	CD	CO
UNITS	MG/G	MG/G	MG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G
EL02532	120.0	17.8	K1.2	7	13000	N.A.	170	2	9	11

PARAMETER #	01034	01042	01045	01055	01062	01067	01051	01102	01152	01087
SAMPLE ID.	CR	CU	FE	MN	MO	NI	PB	SN	TI	V
UNITS	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G	UG/G
EL02532	230	140	35000	780	37	140	540	N.A.	210	44

PARAMETER #	01203	01092	
SAMPLE ID.	Y	ZN	12
UNITS	UG/G	UG/G	UG/G
EL02532	20	2700	N.A.

RESENT 4/8/81

COMPUTATION SHEET

USEPA, REGION V, MICHIGAN-OHIO DISTRICT OFFICE				YEAR
RECEIVED FROM	TIME / DATE	☐ CUSTODY ☐ NON-CUSTODY	REMARKS	GIVEN TO
SOURCE OF SAMPLE: WYANDOTTE STP (EL01), PENNWALT (EL02)				SAMPLE DATE
PARAMETER				UNITS
ANALYZED BY / DATE		CHECKED BY		DATE 11/14/80

MODC Nos.	STATION	COND @ 25°C	TOTAL SOLIDS	SUSP. SOLIDS	BOD_5	TOTAL PHENOL	TOTAL CYANIDE	OIL & GREASE	
21 WYANDOTTE		number	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
L01 S01	INF	986	4153	3472	626	0.056	<.005	—	
S04	INF	—	—	(3576)	—	—	—	66	
S08	EFF	792	538	21	16	0.007	0.096	—	
S11	EFF	—	—	—	—	—	(0.092)	<1	
S23	SLUDGE	—	—	—	—	0.026	<.005	—	
		COND	SULFIDE	SUSP	BOD_5	PHENOL		G&O	STAT.
31 PENNWALT		number	mg/l	SOLIDS	mg/l	mg/l	SAMP #	mg/l	
L02 S01	001	232	—	8	—	—	S02	<1	001
							S03	3	001
S04	002	276	—	11	—	—	S05	<1	002
							S06	<1	002
S07	003	629	—	5	—	—	S08	2	003
							S09	<1	003
S10	005	21,608	—	<5	—	—	S11	<1	005
							S12	1	005
S13	006	244	(S14) <.02	10	9	0.011	S14	<1	006
			(S15) <.02				S15	<1	006
S16	INF	232	—	6	3	<.002	S17	<1	INF
							S18	<1	INF
D19	INF	232	—	8	<2	<.002			
S29	INF TO POND #4	247	(S30) <.02	7	—	0.039			
			(S31) <.02	(10)					
S20	INF TO #2	—	—	—	—	0.620			
S26	INF TO #1	—	—	—	—	<.002			

SPECIAL REMARKS: ( ) = AQC VALUES; pH & BACTI NOT RUN DUE TO EXCESSIVE HOLDING TIMES

HEXAVALENT CHROMIUM = <0.005 for EL01 S01 & S08

Bill - Please transmit

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION BUREAU
POINT SOURCE STUDIES SECTION

Report of an On-site Toxicity Evaluation
Conducted at
PENNWALT CORPORATION
All Outfalls No. 820298
Wayne County
Wyandotte, Michigan
July 7-11, 1980

Summary

During July 7-11, 1980, an on-site toxicity evaluation was conducted on the process effluent from outfall 820223 (005) at Pennwalt Corporation, Wyandotte. Fathead minnows (Pimephales promelas) with a mean length of 45 mm served as the test species in the two continuous-flow tests. In Test A the effluent was tested without additional treatment. In Test B, sulfur dioxide gas was first added to the effluent to remove chlorine and then tested. In both tests the effluent was acutely toxic. The 96-hour LC50 for Test A was estimated at 57% effluent with approximate 95% confidence limits of 50% and 66%. In Test B the estimated 96-hour LC50 was 61% effluent with approximate 95% confidence limits of 50% and 75%. The difference in LC50's was due to the test design rather than the presence of chlorine. The measured chloride concentration ranged from 5,400 - 9,700 mg/l and was the most probable cause of effluent toxicity.

Outfall 820223 (005) discharges directly to the Trenton Channel of the Detroit River. The seven-day, once in 10-year low flow (7Q10) for the Detroit River is approximately 291,000,000 M^3/day. At the observed average flow rate of 6,100 M^3/day, effluent from 820223 (005) would constitute 0.05% of the river volume allowed as a mixing zone during the 7Q10. At that concentration, the effluent would meet the recommended long term safe concentrations and would not be harmful to aquatic life at the edge of Pennwalt's mixing zone and beyond.

Effluent samples collected during the 96-hour study were compared to the limitations set down in Pennwalt's NPDES Permit No. MI0002381 and Final Order No. 1981. Based on those comparisons, the limitations were met during July 7-11, 1980.

Direct comparisons with past toxicity data collected for outfall 820223 (005) are difficult to make due to differences in test methods and species. However it appears that the effluent toxicity has decreased, probably as a result of production changes and improved pH control.

Comments

Pennwalt Corporation has seven outfalls to the Trenton Channel of the Detroit River. Of these only 820223 (005) was evaluated and will be discussed in this

report. Information on the other discharges can be found in the 1980 industrial survey report by Boersen and Erickson. The industrial survey and toxicity evaluation were conducted concurrently.

A portion of the process effluent was treated with SO_2 to remove chlorine which is occasionally present in the effluent. Chlorine is a known toxicant. Running simultaneous studies with and without dechlorination simplifies the identification of other toxicants which may be present in addition to chlorine.

Effluent COD's could not be determined. Chlorides in excess of 2,000 mg/l interfere with the test procedure making the analysis inaccurate or impossible to complete (APHA, 1975).

Plant Processes

Pennwalt's inorganics plant produces chlorine, caustic soda, ferric chloride, ammonium chloride and muriatic acid from salt brine, scrap iron, ammonia and other raw materials. A process schematic is depicted in Figure 1.

During the study period, production was considered normal. The inorganics plant operates 24 hours/day, seven days/week and employs 300 people.

Water Supply, Wastewater & Treatment

The process and cooling waters used in the operations which discharge to outfall 820223 (005) are obtained from the company's south intake (S.[illegible]) on the Trenton Channel (Figure 2). Intake water receives coarse screening and is periodically chlorinated. Domestic water is supplied by the City of Detroit.

Seal water from the liquid ferric pumps, chlorine cell room drains, wash water from the evaporators, wash water from the tank room and back wash from two of the filters used to filter caustic are discharged via outfall S20223 (005). The wash waters from the evaporator department and the caustic filters are the main sources of the chlorides and sulfates found in the effluent.

The combined waste streams are provided settling in one of two settling lagoons. Following continuous pH adjustment with carbon dioxide, sulfuric acid or caustic, the wastewater is monitored and enters a Wayne County Drain prior to entering the Detroit River. The lagoon which is not being used for settling is dredged and the solids disposed of by deep well injection. Clarifier underflow from the brine purification process serves as an injection flux. Any wastewater generated from the replacement of the asbestos diaphragms in the chlorine cell room is also pumped to the inactive lagoon.

Sanitary wastes are discharged to the city sanitary sewer system.

Test Procedures

An Environmental Protection Bureau (E.P.B.) mobile bioassay unit was used to conduct the two on-site continuous-flow tests during July 7-11, 1980. Effluent

from outfall 820223 (005) and Detroit River water from 200 feet upstream of 820223 (005) were combined to create the various test concentrations. Both streams were passed through a heat exchanger to minimize temperature differences. The river water (diluent) was filtered through one mm mesh screening just prior to use in the diluter systems.

In Test A the final effluent was pumped directly from the outfall to the delivery system and was identical to wastewaters actually reaching the Detroit River. A Riley-Wuerthele proportional diluter delivered nominal concentrations of 100, 88, 75, 66, 50, 33, 25, 12 and 0 (diluent control) percent effluent to the five liter test tanks. Each tank contained approximately five liters of test solution. Ninety-nine percent volume replacement occurred every two hours.

In Test B sulfur dioxide gas (SO_2) was added to the effluent to remove any chlorine that might have been present. A Riley-Wuerthele diluter delivered nominal concentrations of 100, 75, 50, 25, 12 and 0 percent effluent to a second set of five liter tanks. Each tank contained about 2.7 liters of test solution with 99% volume replacement occurring hourly.

Every test concentration was replicated. Delivery volumes to each tank were checked twice during the study period. Actual effluent concentrations in the test tanks were determined from conductivity measurements to verify diluter accuracy.

Fathead minnows (Pimephales promelas) less than a year old with a mean weight of one gram and a mean length of 45 mm served as the test species. The fish were collected from a private pond in Jackson County on April 21, 1980. They were given prophylactic doses of formalin and nemmycin sulfate and maintained at the Point Source Studies laboratory. The fish were acclimated in diluent river water for two hours at 22-24 °C prior to testing.

The fish were randomly selected and placed in the test tanks beginning at 1345 on July 7. Loading rates for Tests A and B were ten and five fish per tank respectively. The animals were observed frequently throughout the 96-hour period for signs of stress. Mortality was assessed at 2, 7, 18, 24, 48, 72 and 96 hours (Tables 1 - 2). The 96-hour LC50's were estimated using the binomial test.

Grab samples of the diluent, effluent and test solutions were analyzed on-site for certain parameters. The diluent and effluent were sampled from taps in the mobile laboratory. Test solutions came directly from the fish tanks. The results of the on-site physical and chemical analyses are given in Tables 6 - 8.

In addition to the on-site analyses, the effluent temperature, pH and diluent temperature were continuously recorded.

Twenty-four hour composite samples were collected directly from outfall 820223 (005) and the Detroit River. An automatic air probe sampler composited the process effluent at 15-20 minute intervals. The river (diluent) samples were continuously composited in a submergible jug. Extractable organic contaminants for both streams were analyzed from 4-portion grab-composite samples collected in glass. Grab samples were collected for parameters that could not be composited and to provide data on concentration ranges. The samples were preserved according to Table 10 and shipped to the E.P.B. laboratory in Lansing for analyses. The results appear in Tables 3 - 5.

The effluent flows reported for the toxicity evaluation were taken from the company's July Monthly Operating Report (MOR). The mean monthly discharges, developed by NOAA for the period of record 1936-1974, were used to calculate the Detroit River drought flow. Flow estimates for Pennwalt's mixing zone were provided by the Army Corps of Engineers.

Results & Discussion

Process effluent from outfall 820223 (005) at Pennwalt Corporation was toxic to fathead minnows on an acute (short-term) basis. The 96-hour LC50 for the effluent without SO_2 treatment (Test A) was estimated at 57% effluent with approximate 95% confidence limits of 50 and 66%. For Test B with SO_2 treated effluent, the estimated 96-hour LC50 was 61% effluent with approximate 95% confidence limits of 50 and 75%.

The LC50 is that effluent concentration lethal to 50% of the test organisms within the expressed time period. The LC50's and 95% confidence limits presented here are conservative estimates due to the lack of partial mortality in at least two concentrations. Partial kills are required to generate statistically sound LC50 values.

The onset of stress and mortality was rapid in the toxicity tests. Fish in 88% and 100% effluent were severely affected in less than an hour. Symptoms included hemorrhaging, gasping, gaping mouths, poor balance and occasional erratic swimming and lethargy. The first mortalities were noted within two hours. At the same time fish in the 75% effluent concentration also began to show signs of stress. Within seven hours the animals in 100% effluent were dead. **Within the first 24 hours, all fish in effluent concentrations of 66% and greater had expired.** In the remaining 72 hours of the study only one more death occurred. The toxicity data are summarized in Tables 1 - 2 for Tests A and B.

A major test fish kill occurred between 1100 and 1230 on July 8. The sharp upturn in mortality corresponded to an increase in conductivity which began after 1040. **Effluent concentrations where the measured conductivity equaled or exceeded 21,400 umhos were rapidly fatal. Fish in concentrations where the conductivity was 15,900 umhos or less, were only slightly stressed, or unaffected.**

The highest conductivity reading of the study was made at 1145 on July 10 (Table 6). At that time the conductivity measured 17,500 umhos in the 50% effluent. Fish in the 50% effluent containers became hyperactive and disoriented. By 1425, the conductivity had dropped to 26,500 umhos and fish seemed to recover. WRONG figure

Based on effluent composite and grab sample analyses the most probable toxicant was chloride. No other parameter was present in enough quantity to explain the mortality observed in both tests. The chloride concentration averaged 8000 mg/l ($\bar{x}$ for 2 composites) and ranged from 5400 to 9700 mg/l. The maximum measured level occurred during the fish kill on July 8, although the actual maximum for the study period is unknown. **The chloride concentration was probably even greater on July 10 when the conductivity reached 31,400 umhos.**

The chloride concentration corresponding to the 96-hour LC50 of 57% effluent is estimated to fall somewhere between 4600 and 5500 mg/l. These estimates are derived from the average chloride concentration (8000 mg/l) and the concentration at which the July 8 fish kill occurred. Closer prediction of the 96-hour value is difficult due to the fluctuating chloride concentrations that were found in the effluent during the test. The estimates are in line with 96-hour LC50's determined by Adelman and Smith for fathead minnows. In 16 tests with sodium chloride, they calculated 96-hour LC50's ranging from 4270-5100 mg/l as chloride.[1]

As in the Pennwalt study, Adelman and Smith's test fish were rapidly affected and displayed some similiarity in stress symptoms. In 12 of their 16 tests, no mortality occurred after 48 hours and the 48-hour LC50's were identical to the 96-hour and threshold LC50's. The threshold LC50 is the concentration at which 50% of the test animals can survive indefinitely.

The sulfate concentrations in the effluent from 820223 (005) ranged from 1200-2600 mg/l but were probably not high enough to contribute to the effluent toxicity. In past studies with fathead minnows, the LC50's for sodium sulfate ranged from 9000-14,000 mg/l (6000-9500 mg/l as sulfate) depending upon water hardness and test duration (Becker and Thatcher, 1973).

Residual chlorine was not detected in the effluent at any time during the test period. The slight difference in the 96-hour LC50's for the two tests is due to the wider concentration intervals in Test B rather than to the presence of chlorine in Test A.

The 96-hour LC50 is an accepted reference point for expressing acute toxicity. It is not a "safe" concentration. "Safe" concentrations in an aquatic ecosystem permit all normal life processes and are often estimated from the 96-hour LC50 by the use of application factors.

For non-persistant, non-cumulative toxicants such as chloride, the recommended application factors are:

0.05 - allowable 24-hour average effluent concentration after mixing.

0.1 - maximum allowable effluent concentration at any time or place after mixing (Nat. Acad. Science, 1973).

To achieve "safe" levels, the effluent concentration from outfall 820223 (005) should not exceed 5.7% at the edge of the mixing zone at any time, nor average more than 2.8% there over a 24-hour period.

1 - The actual test results were reported as mg/l sodium chloride. To convert, multiply mg/l chloride x 1.65 = mg/l sodium chloride.

The average effluent flow for the test period was 6100 M^3/day. The seven-day, once in 10-year low flow (7Q10) for the Detroit River is 291,000,000 M^3/day (Fraidenburg, 1979). For the purpose of evaluating compliance with state water quality standards, Pennwalt's mixing zone is defined as the right 100 feet of the Detroit River for 500 feet downstream of the south property line. The mixing zone volume, as estimated from Army Corps of Engineers flow measurements, is about 4.4% of the total river flow (Wilshaw, 1979). At the observed average flow rate, effluent from outfall 820223 (005) would constitute 0.05% of the mixing zone flow during the 7Q10. The effluent would achieve long term safe concentrations at the mixing zone edge at that time.

Effluent sample results are compared to the limitations in Pennwalt's National Pollution Discharge Elimination System (NPDES) Permit No. MI0002381 and Final Order of Abatement No. 1981 in Table 9. Based on those comparisons, the limitations were met during the 96-hour toxicity evaluation. The effluent pH's ranged from 7.6 to 8.9 during the test period.

Study results for suspended solids did not compare well to the company self-monitoring data reported in the July Monthly Operating Report (MOR). With one exception E.P.B. results were two to three times higher than company results.

The only bioassays previously conducted with effluent from outfall 820223 (005) were static screening tests using the macroinvertebrate Daphnia magna. The 48-hour LC50's for the April and November 1978 tests were 45 and 1 respectively (Wolfe, 1978; Waybrant, 1978). The effluent pH's and chlorides for those tests were considerably higher than found during the July 1980 study. The April sample also contained more than 600 mg/l chlorine before dechlorination and testing. Although the test results are not directly comparable due to different test techniques and species, it would appear that the effluent toxicity has decreased. Since 1978, the company has stopped manufacturing perchloran and anhydrous caustic soda and has improved the pH control at 005. These changes are the most likely reasons for the reduced effluent toxicity.

Table 1 Percent mortality of fathead minnows after exposure to concentrations of Pennwalt Corporation effluent. outfall no 0223 (005) during 7-7/11-80.

Percent Effluent - Test A	Percent Mortality/Exposure Period						
	2 hours	7 hours	18 hours	24 hours	48 hours	72 hours	96 hours
100	15	100	100	100	100	100	100
88	0	0	35	100	100	100	100
75	0	0	0	100	100	100	100
66	0	0	0	100	100	100	100
50	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
0 (control)	0	0	0	0	0	0	0

Table 2 Percent mortality of fathead minnows after exposure to concentrations of the same Pennwalt Corporation effluent pretreated with SO_2.

Percent Effluent - Test B	Percent Mortality/Exposure Period						
	2 hours	7 hours	18 hours	24 hours	48 hours	72 hours	96 hours
100	20	100	100	100	100	100	100
75	0	0	0	100	100	100	100
50	0	0	0	0	10	10	10
25	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
0 (control)	0	0	0	0	0	0	0

Table 3 Laboratory analyses of effluent composite samples collected from outfall 820223 (005) at Pennwalt Corporation.

Sample Period From	7-7-80 - 1555		7-9-80 - 0810	
To	7-8-80 - 1555		7-10-80 - 0810	
Computed flow rate[1] (M^3/day)	6,100		5,900	
	mg/l	kg/day	mg/l	kg/day
COD	INT[2]	--	INT	--
TOC	1.6	9.8	1.8	11
Phenol	< 0.005	--	< 0.005	--
Nitrite & nitrate nitrogen-N	0.41	2.5	0.44	2.6
Ammonia nitrogen-N	0.18	1.1	0.30	1.8
Kjeldahl nitrogen-N	0.33	2.0	0.96	5.7
Orthophosphates-P	0.02	0.1	--	--
Total phosphorus-P	0.05	0.3	0.054	0.32
Chlorides	7,500	46,000	8,500	50,000
Sulfate (SO_4)	2,200	13,000	1,200	7,100
Bromide	--	--	< 10	--
Suspended solids	27	160	29	170
Dissolved solids	16,000	98,000	15,000	88,000
	ug/l		ug/l	
Total cadmium (Cd)	0.04	0.2	< 0.002	0.002
Total chromium (Cr)	0.05	--	< 0.005	--
Total copper (Cu)	0.00	--	< 0.002	--
Total nickel (Ni)	< 0.05	--	0.003	0.03
Total lead (Pb)	< 0.005	--	< 0.005	--
Total zinc (Zn)	< 0.05	--	< 0.005	--
Total iron (Fe)	0.59	3.6	0.96	5.7
Total magnesium (Mg)	1	6	2	10
Total sodium (Na)	6,800	41,000	6,500	38,000
Total calcium (Ca)	14	85	17	100
Total mercury (Hg)	< 0.001	--	< 0.001	--
PCB 1242	--	--	< 0.1	0.002
PCB 1254	--	--	< 0.1	--
PCB 1260	--	--	< 0.1	--
Di-n-butyl phthalates (DBP)	--	--	< 2	0.01
Bis(2-ethylhexyl) phthalates (DEHP)	--	--	10	0.05
Persistant chlorinated hydrocarbons	--	U[4]	--	--
Hexachlorobutadiene (HCBD)	--	--	< 0.02	--
2,4,6 Trichloronphenol (2,4,6TCP)	--	--	< 0.1	0.0006
pentachlorophenol (PCP)	--	--	0.2	0.001

1 - Flow rate used to compute kg/day - calculated from company MOR'(weighted average).
2 - INT = interference
3 - Test method not approved.
4 - U = undetected

Table 4 Laboratory analyses of diluent composite samples collected from the Detroit River.

Sample Period From	7-7-80 - 1500	7-9-80 - 0920
To	7-8-80 - 1500	7-10-80 - 0900
	mg/l	mg/l
COD	10	12
TOC	2.2	2.2
Phenol	< 0.0005	< 0.005
Nitrite & nitrate nitrogen-N	0.30	0.30
Ammonia nitrogen-N	0.28	0.33
Kjeldahl nitrogen-N	0.77	0.82
Total phosphorus-P	0.11	0.080
Chlorides	17.4	17.0
Sulfate (SO_4)	19	32
Bromide[2]	< 1	< 1
Suspended solids	14	20
Dissolved solids	130	330
Total cadmium (Cd)	< 0.002	< 0.002
Total chromium (Cr)	< 0.005	0.006
Total copper (Cu)	0.006	0.006
Total nickel (Ni)	0.005	0.006
Total lead (Pb)	0.005	< 0.005
Total zinc (Zn)	0.03	0.02
Total iron (Fe)	0.88	1.7
Total mercury (Hg)	< 0.001	< 0.001
Total magnesium (Mg)	8	8
Total calcium (Ca)	40	40
Total sodium (Na)	12	16
	ug/l	ug/l
*PCB 1242	0.4	< 0.1
*PCB 1254	< 0.1	< 0.1
*PCB 1260	< 0.1	< 0.1
*Di-n-butyl phthalates (DBP)	2	< 1
*Bis(2-ethylhexyl) phthalates (DEHP)	10	3
*Other persistant chlorinated hydrocarbons	U[1]	U
Hexachlorobutadiene (HCBD)	< 0.02	< 0.02
*2,4,6 Trichlorophenol (2,4,6 TCP)	< 0.1	< 0.1
*Pentachlorophenol (PCP)	< 0.1	< 0.1

* Sample period 7/7/80 @ 2200 - 7/8/80 @ 2115
1 U = undetected
2 - Test method not approved.

Table 5 Laboratory analyses of grab samples collected during 7/7-11/80 at Pennwalt Corporation.

Sampling Location	820223 (005)			Detroit River (Diluent)	
Date	7-7-80	7-8-80	7-9-80	7-7-80	7-9-80
Time	2400	1010	1338	2200	1338
Temperature (°C)	27	30	--	--	--
	mg/l	mg/l	mg/l	mg/l	mg/l
COD	INT[1]	INT	--	--	8
TOC	1.4	1.9	--	--	2.4
Phenol	--	--	--	--	< 0.005
Nitrite & nitrate nitrogen-N	0.32	0.34	--	--	--
Ammonia nitrogen-N	0.15	0.24	0.21	--	--
Kjeldahl nitrogen-N	0.44	0.92	--	--	--
Orthophosphates-P	0.02	0.03	--	--	--
Total phosphorus-P	0.04	0.07	--	--	--
Chlorides	5,400	8,500	9,700	--	--
Sulfate (SO_4)	--	--	2,600	--	--
Total bromides[4]	--	--	< 10	--	--
Suspended solids	6	19	--	--	--
Dissolved solids	12,000	20,000	--	--	--
Total cadmium (Cd)	0.03	0.04	--	--	< 0.002
Total chromium (Cr)	< 0.05	< 0.05	--	--	0.006
Total copper (Cu)	0.02	0.04	--	--	0.006
Total nickel (Ni)	< 0.05	< 0.05	--	--	0.005
Total lead (Pb)	< 0.005	< 0.005	--	--	< 0.005
Total zinc (Zn)	< 0.05	< 0.05	--	--	0.02
Total iron (Fe)	0.35	1.0	--	--	1.6
Oil & Grease (I.R.)	< 1	< 1	--	1	3
Oil & Grease (Grav.)	< 2	< 2	--	< 2	2

Table 5 (continue

Sampling Location	820223 (005)				Detroit River (Diluent)	
Date	7-7-80	7-8-80	7-8-80	7-9-80	7-7-80	7-9-80
Time	2400	1010	1310	1338	2200	1338
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
PCB 1242	< 0.1	< 0.1	--	--	--	--
PCB 1254	< 0.1	< 0.1	--	--	--	--
PCB 1260	< 0.1	< 0.1	--	--	--	--
Hexachlorobutadiene (HCBD)	< 0.1	< 0.1	--	--	--	--
Hexachlorocyclopentadiene (HCP)	< 0.1	< 0.1	--	--	--	--
Octachlorocyclopentene	< 0.1	< 0.1	--	--	--	--
Hexachlorobenzene (HCB)	< 0.1	< 0.1	--	--	--	--
Dichlorobenzene (DCB)	< 0.1	< 0.1	--	--	--	--
Pentachlorophenol (PCP)	Trace[2]	Trace	--	--	--	--
2,4,6 Trichlorophenol (2,4,6 TCP)	0.1	0.1	--	--	--	--
Other chlorinated phenols	U[3]	U	--	--	--	--
Persistant chlorinated hydrocarbons	U	U	--	--	--	--
1,2 Dichloropropane	6	7	--	8	8	10
Chloroform	4	8	--	5	--	< 1
Other chlorinated and brominated volatile hydrocarbons	U	U	--	--	U	--
Perchloroethylene	--	--	--	--	Trace	--

1 - INT = interference
2 - Present but in quantity< accepted lower test limit (<0.1 ug/l for PCP; <1 ug/l for perc).
3 - U = undetected
4 - Test method not approved.

Table 6 On-site analyses of effluent grab samples collected during the July 7-11, 1980 test at Pennwalt Corporation's outfall 820223 (005).

Date	Time	Temp.* (°C)	pH (S.U.)	Conductivity (umhos)	Dissolved Oxygen (mg/l)	Total Chlorine (mg/l)	Total Alkalinity (mg/l)	Total Hardness (mg/l)
7-7-80	1330	24	8.0	20,200	7.8			
7-7-80	1550	25	7.9	19,100	7.6	U[1]		
7-7-80	2210	25	8.0	20,900	7.4	U	1,900	60
7-8-80	0815	24	7.8	19,700	7.3	U	900	60
7-8-80	1040	27	8.1	19,900	6.8			
7-8-80	1330	28	8.1	28,700	6.8	U		
7-8-80	1555	28	8.1	27,600	7.1			
7-8-80	2115	26	7.9	18,200	7.2			
7-9-80	0800	24	7.6	13,700	7.2	U	840	48
7-9-80	1100	24	8.0	--	7.2			
7-9-80	1305	24	8.2	18,300	7.2			
7-9-80	1530	25	8.2	20,800	7.1	U		
7-9-80	2115	25	8.2	25,100	7.0	U		
7-10-80	0800	24	8.1	25,400	8.1	U		
7-10-80	1125	28	8.2	31,400	6.6	U	3,000	56
7-10-80	1405	28	8.2	26,500	6.9			
7-10-80	1545	28	8.3	25,000	6.9			
7-10-80	2145	26	8.3	18,200	6.7			
7-11-80	0810	25	8.3	25,100	7.3	ND	1,700	52
7-11-80	1030	27	8.0	20,900	7.0			
7-11-80	1330	28	8.0	20,300	6.9			

1 - Undetectable
* - After heat exchanger.

Table 7 On-site an s of diluent (Detroit River) grab samples col l during July 7-11, 1980.

Date	Time	Temp.* (°C)	pH (S.U.)	Conductivity (umhos)	Dissolved Oxygen (mg/l)	Total Chlorine (mg/l)	Total Alkalinity (mg/l)	Total Hardness (mg/l)
7-7-80	1330	23	7.8	250	7.4			
7-7-80	1550	24	7.8	249	7.3	Trace[1]		
7-7-80	2210	23	7.6	238	7.2		84	100
7-8-80	0815	23	7.5	245	7.4	U[2]	88	100
7-8-80	1040	24	7.8	243	7.2			
7-8-80	1330	25	7.7	261	7.4			
7-8-80	1555	24	7.9	258	7.2			
7-8-80	2115	23	8.0	225	6.9			
7-9-80	0800	22	7.5	262	6.3	U	84	96
7-9-80	1100	23	7.6	255	6.5			
7-9-80	1305	22	7.7	253	6.4			
7-9-80	1530	23	7.5	243	6.7	U		
7-9-80	2115	23	7.6	273	6.3			
7-10-80	0800	22	7.4	244	6.8	U		
7-10-80	1125	24	7.4	243	6.7		84	100
7-10-80	1405	25	7.5	248	6.8			
7-10-80	1545	25	7.5	235	7.0			
7-10-80	2145	23	7.7	260	6.8			
7-11-80	0810	23	7.6	237	6.8	U	84	100
7-11-80	1030	24	7.4	243	6.7			
7-11-80	1330	26	7.6	230	6.7			

1 - Chlorine present but in quantity << acceptable lower detection limit of 0.2 mg/l
2 - Undetectable
* - After heat exchanger.

Table 8 On-site analyzed of grab samples collected from test containers during the 7/7-11/80 test at Pennwalt Corporation's outfall 820223 (005).

Test A - Effluent as discharged to Detroit River

Date	Time	% Effluent	Temp. (°C)	pH (S.U.)	Conductivity (umhos)	Dissolved Oxygen (mg/l)
7-8-80	1400	88	28	8.2	25,600	7.0
		75	27	8.3	22,300	7.2
		66	27	8.3	21,400	7.1
		50	26	8.3	15,900	7.0
		33	26	8.3	11,300	6.9
		25	26	8.3	8,580	7.0
		12	26	8.3	4,770	7.0
		0	25	7.9	262	7.1
7-10-80	1330	50	26	8.3	15,200	6.8
		33	26	8.3	11,400	6.9
		25	26	8.3	8,260	6.9
		12	26	8.2	4,560	6.7
		0	26	7.8	271	6.8

Test B - Effluent treated with SO_2

7-9-80	1100	50	22	8.2	9,460	6.8
		25	22	8.2	4,640	6.7
		12	22	8.1	2,730	6.7
		0	22	8.0	294	7.0
7-10-80	1330	50	26	8.3	15,200	7.0
		25	26	8.3	8,190	7.1
		12	26	8.2	4,310	7.1
		0	25	7.7	248	7.1

Table 9 Comparison of Study results with Fenwall's NPDES Permit and Monthly Operating Report.

Parameter (Unit)	NPDES Permit Final Limitations Daily Average	Daily Maximum	Monthly Average	Monthly Maximum	Monthly Monthly Operating Report 7-7-80	7-8-80	7-9-80	7-10-80
830223 (005)								
Flow (M^3/day)	--	--	6,800	7,600	6,100	6,100	5,700	6,400
Suspended solids (mg/l)	35	70	30	358	7	10	8	10
(kg/day)	212	425	200.	2,435	42	60.3	45.8	64.0
Ammonia nitrogen-N (mg/l)	1.0	1.5	0.36	1.38	--	0.62	--	0.00
pH (S.U.)	not <6.5 nor >9.5		--	12.4	8.8	8.6	8.3	8.8
		Min.	--	2.7	7.8	7.5	7.3	7.6
Chlorides (mg/l)	--	--	6,836	9,372	--	7,480	--	7,572
Total chlorine residual (mg/l)	1.0	1.5	0.00	0.05	0.00	0.00	0.00	0.00
COD (kg/day)	--	821	58.5	221	130	--	12	--
Lead (ug/l)	100	200	8	10	--	--	10	--
(kg/day)	0.6	1.2	0.050	0.054	--	--	0.054	--
Oil & Grease (visual)	No visible film		0	0	0	0	0	0
(mg/l)	Quantitative analyses not req'd.		--	--	--	--	--	--
Temperature (°F)	--	--	80	87	68	81	79	--

	Study Results[1] 7/7-8/80	7/9-10/80
Suspended solids (mg/l)	27 (6, 19)	29
(kg/day)	160	170
Ammonia nitrogen-N (mg/l)	0.18 (0.15, 0.24, 0.21)	0.30
pH (S.U.)	8.6[2]	8.5
Min.	7.8	7.6
Chlorides (mg/l)	7,500 (5,400, 8,500, 9,700)	8,500
Total chlorine residual (mg/l)	U[3]-See Table 6	U-See Table 6
COD (kg/day)	INT[4] (INT, INT)	INT
Lead (ug/l)	<5 (<5, <5)	<5
Oil & Grease (mg/l)	<2 <2	< 2
Temperature (°F)	-- (81, 86)	--

1 - Study results are from Tables 3 - 5. Grab sample ranges are shown in parentheses ( ).
2 - pH values from continuous record and Table 6.
3 - U = undetected 4 - INT = Interference
To obtain MGD multiply M^3/day by 0.0002642 To obtain lbs/day multiply kg/day by 2.205

Table 10 Sample Preservation

Parameter	Preservative
COD/TOC/Phenol (Chlorine Absent)	10 drops conc. H_2SO_4/250 ml (to pH <2).
Total Metals	2 ml 1:1 HNO_3/250 ml (to pH <2).
Oil & Grease	10 drops conc. H_2SO_4/250 ml (to pH <2).
Acid & Base-neutral Extractables & Purgeables	Dechlorinated (if needed) with sodium thiosulfate (1 drop 0.14[illegible] N/mg/l Cl2/250 ml).

All samples cooled to 4°C and preserved upon collection and chain of custody maintained.

Toxicity Evaluation by: Bonnie L. White, Aquatic Biologist
Jane Wygant, Student Aide

Contact with Management: John Lewis, Supervisor of Environmental Control & Certified Operator

Chemical & Physical Analyses by: Environmental Protection Services Laboratory

Report by: Bonnie White
Point Source Studies Section
Environmental Services Division
Environmental Protection Bureau
Michigan Department of Natural Resources

Distribution "A"
MM
2/18/81

References Cited

Adelman, I.R. and L.L. Smith, Jr. 1976. Standard test fish development - Part I. EPA-600/3-76-061a. US EPA-Environ. Res. Lab., Duluth MN. 77 p.

American Public Health Assoc. (APHA), American Water Works Assoc., and Water Pollution Control Federation. 1971. Standard methods for the examination of water and wastewater. 14th ed. APHA Inc, Washington D.C. p. 552.

Becker, C.D. and T.O. Thatcher. 1973. Toxicity of power plant chemicals to aquatic life. USAEC and Battelle Pacific Northwest Labs, Richland Wash. p. M22.

Boersen, G. and W. Erickson. 1980. Report of an industrial wastewater survey conducted at Pennwalt Corporation - Wyandotte, MI. July 7-8, 1980. Mich. Dept. Nat. Res. 22 p.

Fraidenburg, A. 1979. Personal Communication. Mich. Dept. Nat. Res.

National Academy of Sciences. 1973. Water Quality Criteria - 1972. U.S. Government Printing Office, Washington, D.C. 594 p.

Wilshaw, R. 1979. Personal communication. Army Corps of Engineers, Detroit.

Figure 1 Pennwalt Corporation - East Plant

Process Flow Diagram

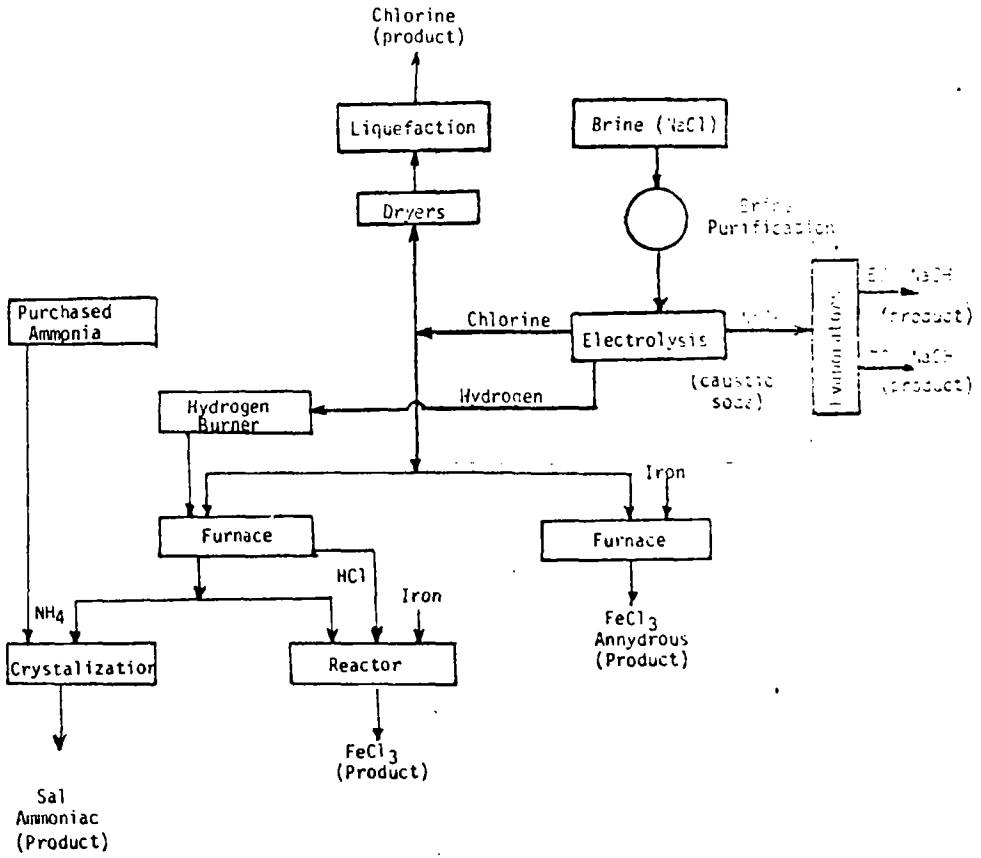
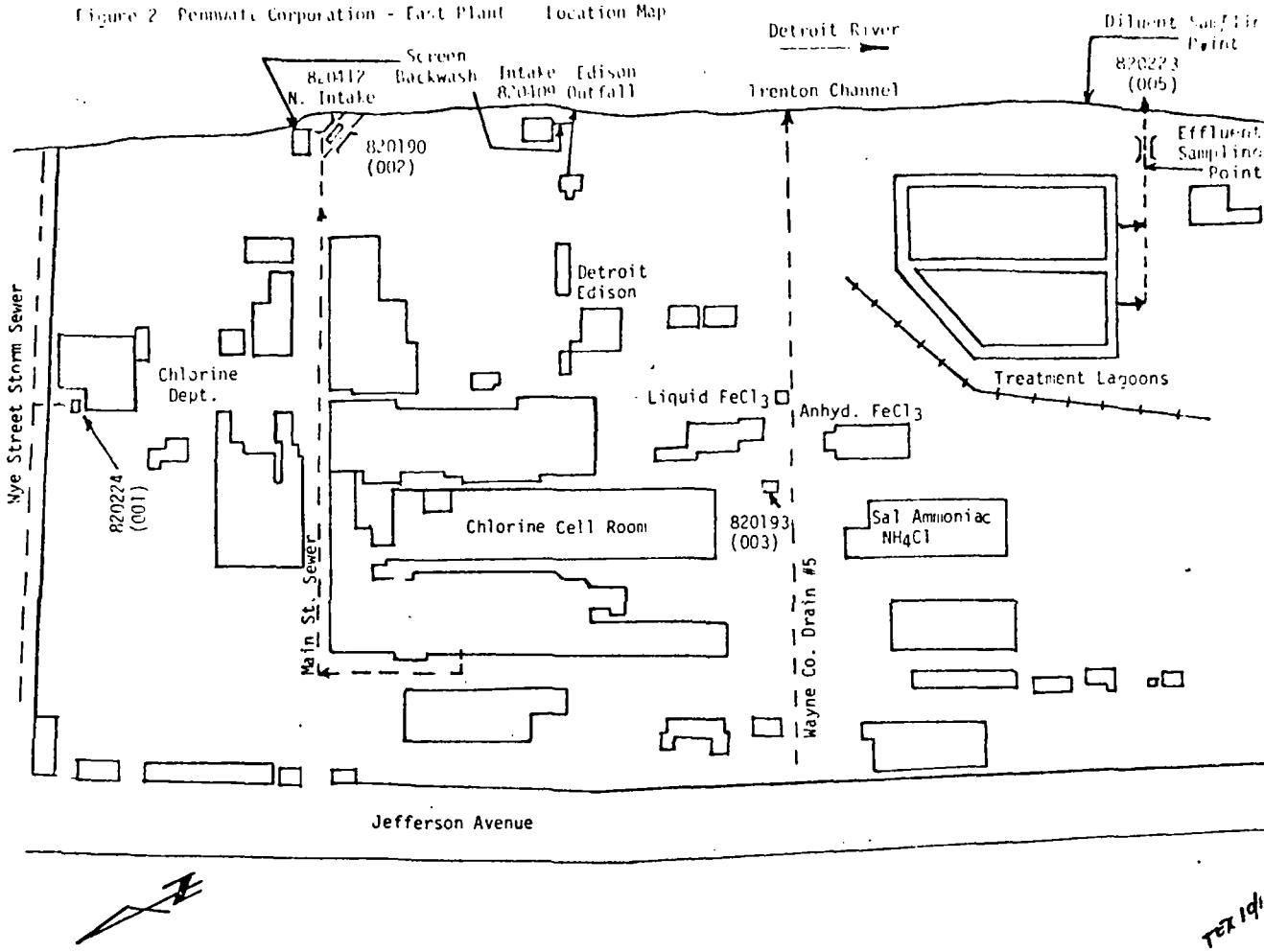
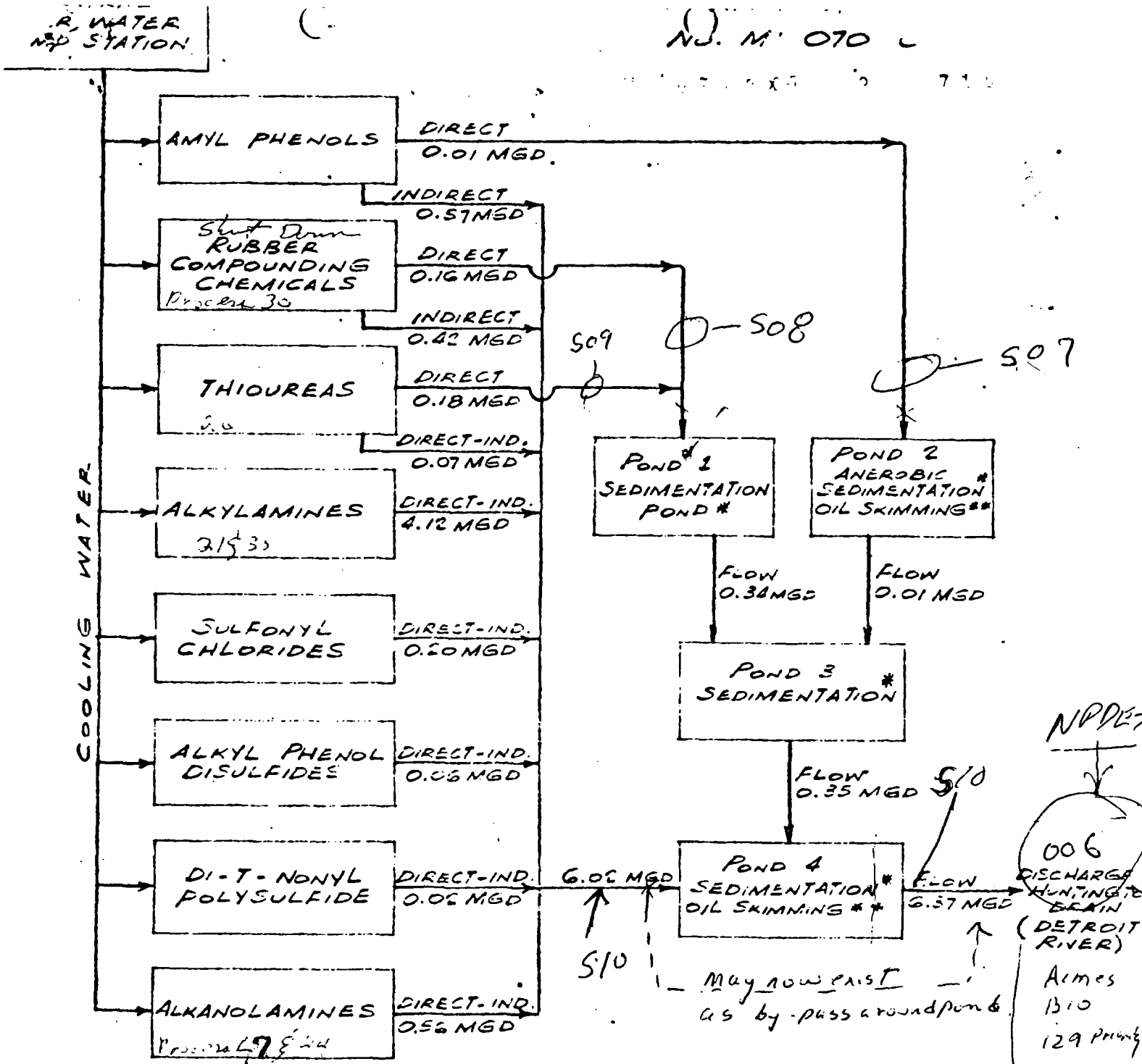


Figure 2 Penwalt Corporation - East Plant Location Map





* SOLIDS TO LAND FILL
** OIL TO LICENSED DISPOSAL CONTRACTOR

NOTE: ALL FLOWS ONCE THROUGH COOLING WATER

SCHEMATIC DIAGRAM PLANT EFFLUENTS DISCH. SER. No. 006			
SCALE	–	DATE	6-9-70
DRAWN	FRENCH	APP'D.	
PENNWALT CORPORATION			
SK. NO.	WW2-3383		

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION BUREAU
POINT SOURCE STUDIES SECTION

Report of an
Industrial Wastewater Survey
Conducted at
PENNWALT CHEMICAL CORPORATION
All Outfalls No. 820298
NPDES No. MI0002381
Wayne County
Wyandotte, Michigan
July 7-8, 1980

Survey Summary

Wastewater monitoring was performed during one twenty-four hour survey period starting Monday, July 7, 1980.

The results of this survey are compared to the final limitations in the facility's National Pollutant Discharge Elimination System (NPDES) Permit, No. MI0002381 as established under Final Order of Abatement No. 1981 entered on October 20, 1977.

Based on that comparison the BOD_5 loading limitations at outfall 821088 (006) was exceeded during the survey (Table 3).

The survey results are compared to the company's self-monitoring results reported in the Monthly Operating Report (MOR). The comparison of these results is presented as Table 3. The only major discrepancies occurred at the intake, 820409. Survey concentrations for suspended solids are significantly lower than the concentrations reported by the company on the survey dates. The total iron concentration found at the intake during the survey was also significantly less than any reported by the company for the month (Table 3).

The composite samples were split with the company for comparison of laboratory results. The comparison is presented as Table 4. No major discrepancies are noted.

The last survey performed at this facility was in November, 1978. Since the last survey several process changes have occurred at the plant. The perloran, orthosil and anhydrous caustic process have all been discontinued. Also the liquid ferric process waters have been routed from outfall 003 to outfall 005. These changes have resulted in a sharp decrease in the chlorides concentration and an increase in the total iron concentration this survey at outfall 005. A significant decrease in total iron concentration is also noted at outfall 006 (Table 5).

Survey Comments

The sal ammoniac process was down during the survey period.

The results from organic scans performed for various volatile organics, acid extractables and base/neutral extractables are presented in Table 2.

A 96-hour acute toxicity evaluation of outfall 005 was performed by the bioassay unit the same week in which his survey was conducted. The results from this study are included in a separate report.

Plant Processes

The Pennwalt Corporation in Wyandotte manufactures organic and inorganic chemicals in two separate plants. The inorganic plant manufactures chlori-Alkali industrial chemicals and iron chlorides. The organic plant manufactures industrial organic chemicals and miscellaneous special organic compounds.

The inorganics plant or east complex utilizes salt brine, ammonia, silica, scrap iron and various other raw materials. A process schematic of the plant is depicted in Figure 1. Production facilities and the plant layout are shown in Figure 2.

The organics plant or west complex synthesizes organic compounds from various raw organic materials. The chief products are alkylamines and rubber chemicals. About 100 different compounds are produced at the plant. Figure 3 illustrates the plant layout.

Production at both plants was considered normal during the survey. Both plants operate 24 hrs/day, 7 days/wk. The inorganic plant employs about 300 people and the organic plant about 250 people.

Water Supply, Wastewater & Treatment

All process and cooling water used in both plants is obtained through two intakes on the Trenton Channel of the Detroit River. The north intake (820412) supplies only the barometric condensers in the evaporator department. The south intake (820409) services the remainder of the inorganic plant, the organic plant and the Detroit Edison Plant in the east complex. Domestic water is supplied by the City of Detroit.

Both intakes have a continuous backwash on the intake screens. The south intake's backwash is discharged into the Detroit Edison plant's outfall. Both backwashes are unpermitted. The water from the south intake is periodically chlorinated.

Non-contact cooling water from the chlorine liquidation process is discharged through outfall 820224 (001).

Outfall 820190 (002) discharges cooling water from the barametric condensers and chlorine cell room, rinse wall from sodium hydroxide storage tanks, flue gas scrubber water, sulfuric acid tank cooling water and yard drainage. About 95% of the wastewater originates from the barometric condensers. The pH of the wastewater is adjusted using carbon dioxide, sulfuric acid or caustic prior to discharge.

Outfall 820193 (003) discharges cooling water from the ammonium chloride process. The pH is adjusted using carbon dioxide, sulfuric acid or caustic prior to monitoring and discharge into the Wayne County Drain No. 5.

Seal water from the liquid ferric pumps, chlorine cell room drains, wash water from the evaporators, wash water from the tank room and back wash from two of the filters used to filter caustic are discharged via outfall 820223 (005). The corbined waste streams are provided settling in one of two settling lagoons. Following continuous pH adjustment with carbon dioxide, sulfuric acid or caustic, if necessary, the wastewater is monitored and enters a Wayne County Drain prior to entering the Detroit River. The lagoon which is not being used for settling is dredged and the solids disposed of by deep well injection. The lagoon not in use is also used to receive any wastewater generated from the replacement of the asbestoes diagram filters in the chlorine cell room.

All process and cooling water from the organics plant or west complex is treated as depicted in Figure 3. Pond 1 receives wastes from the pilot plant. Phenolic wastes are discharged to Pond 2 for equalization of loadings from the plant. Following a third pond these wastes, other process wastes and cooling water are discharged to Pond 4. The cooling water which comprises about 55% of the total flow through outfall 006 is discharged into the end of Pond 4. The major treatment provided in the treatment scheme is equalization of slug loads, settling and oil skimming and pH adjustment as necessary using sulfuric acid or caustic. After Pond 4 the wastewater is discharged to Mongaugon Creek through outfall 821088 (006).

Sludge from the wastewater treatment in the organics plant and residues from plant processes are discharged in a containment lagoon south of the organics plant.

All sanitary wastes are discharged to the city's sanitary sewer system.

Survey Procedure

The flows and samples were obtained as follows:

Outfall	Flow Measurement	Sampling
820224 (001)	Company totalizer.	Automatic air activated sampler & individual grabs.
820190 (002)	Company totalizer.	Submergible sampler & individual grabs.
820193 (003)	Company totalizer.	Automatic air activated sampler & individual grabs.
820223 (005)	11.25 inch Parshall flume and water level recorder.	Automatic air activated sampler & individual grabs.
821088 (006)	Company totalizer.	Automatic air activated sampler & individual grabs.
820412 (North Intake)	None	Submergible sampler & individual grabs.
820409 (South Intake)	None	Submergible sampler & individual grabs.

A water level recorder provides a continuous account of the liquid level or head through a flume. A head versus time graph is obtained for the duration of the survey period. The total volume of wastewater through the flume during the survey period is computed from the graph.

An automatic sampler composites samples at timed intervals.

A submergible sampler obtains samples at a continuous rate.

Polychlorinated biphenyl (PCB) and sulfide composite samples are collected by the grab composite method.

An individual grab is a single instantaneous sample.

Samples were analyzed by the Environmental Protection Bureau Laboratories located in Lansing.

Samples were preserved according to Table 6. The results of the physical, chemical and bacteriological analyses are presented in Tables 1 & 2.

Pennwalt Chemical Corporation - Wyandotte

Table 1 Analyses of composite samples.

Outfalls		820224 (001)		820190 (002)	
Survey Period	From	7-7-80 - 1345		7-7-80 - 1655	
	To	7-8-80 - 1345		7-8-80 - 1655	
Computed flow rate* (M^3/day)		(21,500)		(55,400)	
		mg/l	kg/day	mg/l	kg/day
Suspended solids		14	300	15	830
Dissolved solids		160	3,400	200	10,000
O		7	200	9	500
C		2.0	43	2.4	130
Phenol		0.007	0.2	< 0.005	--
Nitrite & nitrate nitrogen-N		0.36	7.7	0.32	18
Ammonia nitrogen-N		0.23	4.9	0.24	13
Kjeldahl nitrogen-N		0.48	10.	0.52	29
Orthophosphates-P		0.04	0.9	0.05	3
Total phosphorus-P		0.07	2	0.09	5
Chlorides		--	--	36.	2,000
Total cadmium (Cd)		< 0.02	--	< 0.02	--
Total chromium (Cr)		< 0.05	--	< 0.05	--
Total copper (Cu)		< 0.02	--	< 0.02	--
Total nickel (Ni)		< 0.05	--	< 0.05	--
Total lead (Pb)		< 0.05	--	< 0.05	--
Total zinc (Zn)		< 0.05	--	< 0.05	--
Total iron (Fe)		0.76	16	0.77	43

* Flow rates used in the computation of kg/day (obtained from company totalizer/MOR).
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Pennwalt Chemical Corporation - Wyandotte

Table 1 (continued)

Outfalls		~~820193 (003)~~		820223 (005)	
Survey Period	From	7-7-80 - 1445		7-7-80 - 1555	
	To	7-8-80 - 1445		7-8-80 - 1555	
Computed flow rate* (M^3/day)		(23,200)		4,340	
Highest flow rate (M^3/day)		--		11,900 - 7-8-80 @ 0023	
Lowest flow rate (M^3/day)		--		977 - 7-8-80 @ 0022	
		mg/l	kg/day	mg/l	kg/day
Suspended solids		13	300	27	120
Dissolved solids		390	9,000	16,000	69,000
COD		11	260	Int	--
TOC		2.4	56	1.6	6.9
Phenol		0.007	0.2	< 0.005	--
Nitrite & nitrate nitrogen-N		0.47	11	0.41	1.8
Ammonia nitrogen-N		0.64	15	0.18	0.78
Kjeldahl nitrogen-N		1.1	26	0.33	1.4
Orthophosphates-P		0.06	1	0.02	0.09
Total phosphorus-P		0.17	3.9	0.05	0.2
Chlorides		148	3,430	7,500	33,000
Sulfate (SO_4)		--	--	2,200	9,500
Magnesium (Mg)		--	--	1	4
Sodium (Na)		--	--	6,800	30,000
Calcium (Ca)		--	--	14	61
Total cadmium (Cd)		< 0.02	--	~~0.04~~	0.2
Total chromium (Cr)		< 0.05	--	< 0.05	--
Total copper (Cu)		< 0.02	--	~~0.03~~	0.1
Total nickel (Ni)		< 0.05	--	< 0.05	--
Total lead (Pb)		0.009	0.2	< 0.005	--
Total zinc (Zn)		< 0.05	--	< 0.05	--
Total iron (Fe)		0.78	18	0.59	2.6
Total mercury (Hg)		--	--	< 0.001	--

* Flow rates used in the computation of kg/day (obtained from company totalizer/MOR).
Int - Interference
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Pennwalt Chemical Corporation - Wyandotte

Table 1 (continued)

Outfalls		821088 (006)		820412 (Intake)
Survey Period	From	7-7-80 - 1415		7-7-80 - 1635
	To	7-8-80 - 1415		7-8-80 - 1635
Computed flow rate* (M^3/day)		(32,500)		--
		mg/l	kg/day	mg/l
Suspended solids		8	300	6
Dissolved solids		160	5,200	400
COD		37	1,200	9
TOC		15.	490	2.3
Phenol		0.009	0.3	< 0.005
Sulfide (S)		< 0.01	--	--
BOD_5		15.	490	3.5
Nitrite & nitrate nitrogen-N		0.34	11	0.30
Ammonia nitrogen-N		0.46	15	0.27
Kjeldahl nitrogen-N		3.6	120	0.64
Orthophosphates-P		0.01	0.3	0.02
Total phosphorus-P		0.08	3	0.08
Chlorides		21	680	26.
Total cadmium (Cd)		< 0.02	--	< 0.02
Total chromium (Cr)		< 0.05	--	< 0.05
Total copper (Cu)		< 0.02	--	< 0.02
Total nickel (Ni)		< 0.05	--	< 0.05
Total lead (Pb)		< 0.005	--	< 0.05
Total zinc (Zn)		< 0.05	--	< 0.05
Total iron (Fe)		0.57	19	0.52
		ug/l		ug/l
PCB 1242		< 0.1	--	< 0.2
PCB 1254		< 0.1	--	< 0.1
PCB 1260		< 0.1	--	< 0.1

* Flow rates used in the computation of kg/day (obtained from company totalizer/MOR).
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Pennwalt Chemical Corporation - Wyandotte

Table 1 (continued)

Outfall		820409 (South Intake)
Survey Period	From	7-7-80 - 1530
	To	7-8-80 - 1530
		mg/l
COD		9
TOC		2.2
Phenol		< 0.005
Nitrite & nitrate nitrogen-N		0.30
Ammonia nitrogen-N		0.26
Kjeldahl nitrogen-N		0.56
Orthophosphates-P		0.03
Total phosphorus-P		0.06
Chlorides		13.5
Sulfate (SO_4)		16
Total cadmium (Cd)		< 0.02
Total chromium (Cr)		< 0.05
Total copper (Cu)		< 0.02
Total nickel (Ni)		< 0.05
Total lead (Pb)		< 0.05
Total zinc (Zn)		< 0.05
Total iron (Fe)		0.21

Table 2 (continued)

Date	Time	Ortho-phosphates-P mg/l	Total phosphorus-P mg/l	Chlorides mg/l	Sulfide mg/l	Susp. solids mg/l	Total diss. solids mg/l	Total cadmium mg/l	Total copper mg/l	Total chromium mg/l	Total nickel mg/l
820224 (001)											
7-7-80	2255	0.04	0.09	12.0	--	11	--	--	--	--	--
7-8-80		0.04	0.10	12.5	--	25	--	--	--	--	--
820190 (002)											
7-7-80	2230	0.04	0.14	40.	--	16	210	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	0900	0.05	0.14	37.	--	16	180	0.02	< 0.02	< 0.05	< 0.05
820193 (003)											
7-7-80	2350	0.08	0.19	140	--	13	380	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	0945	0.07	0.17	149	-	14	410	< 0.02	< 0.02	< 0.05	< 0.05
820223 (005)											
7-7-80	2400	0.02	0.04	5,400	--	6	12,000	0.03	0.02	< 0.05	< 0.05
7-8-80	1010	0.03	0.07	8,500	--	19	20,000	0.04	0.04	< 0.05	< 0.05
821088 (006)											
7-7-80	2120	< 0.01	0.08	18.0	< 0.01	13	140	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	1000	0.02	0.10	21	< 0.01	11	160	< 0.02	< 0.02	< 0.05	< 0.05
820412 (North Intake)											
7-7-80	2215	0.03	0.07	14.7	--	--	--	< 0.02	< 0.02	< 0.05	< 0.05
7-8-80	0845	0.03	0.09	13.1	--	--	--	< 0.02	< 0.02	< 0.05	< 0.05
820409 (South Intake)											
7-7-80	1550	--	--	--	--	16	130	--	--	--	--
7-8-80	1115	--	--	--	--	16	140	--	--	--	--

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Pennwalt Chemical Corporation - Wyandotte

Table 2 Analyses of grab samples.

Date	Time	Temp.[1] °C	pH[1] S.U.	Residual[1] Chlorine mg/l	O&G I.R. mg/l	O&G Grav. mg/l	COD mg/l	TOC mg/l	Phenol mg/l	BOD_5 mg/l	Nitrite & nitrate nitrogen mg/l	Ammonia nitrogen mg/l	Kjeldahl nitrogen mg/l
820224 (001)													
7-7-80	2255	23.5	7.7	U	--	--	8	2.3	--	--	0.36	0.20	0.44
7-8-80	0825	24.0	7.7	U	--	--	10	3.0	--	--	0.35	0.26	0.58
820190 (002)													
7-7-80	2230	33.5	7.8	T	1	< 2	7	2.2	--	--	0.43	0.22	0.51
7-8-80	0900	34.0	8.0	0.3	1	< 2	18	2.7	--	--	0.33	0.30	0.71
820193 (003)													
7-7-80	1430	--	--	1.05	--	--	--	--	--	--	--	--	--
7-7-80	2350	26.0	7.7	1.10	2	< 2	11	2.4	--	--	0.46	0.61	1.0
7-8-80	0945	26.5	8.0	0.90	1	< 2	13	2.6	--	--	0.45	0.68	1.1
820223 (005)													
7-7-80	2400	27.0	7.9	U	< 1	< 2	Int.	1.4	--	--	0.32	0.15	0.44
7-8-80	1010	30.0	8.0	U	< 1	< 2	Int.	1.9	--	--	0.34	0.24	0.92
821088 (006)													
7-7-80	2120	28.0	8.6	U	9	14	45	11.	< 0.005	13.	0.35	0.38	1.4
7-8-80	1000	29.0	8.7	U	3	2	32	6.6	0.021	8.8	0.38	0.55	1.5
820412 (North Intake)													
7-7-80	2215	21.5	7.7	--	1	< 2	10	2.3	--	3.3	0.30	0.25	0.49
7-8-80	0845	22.0	7.7	--	4	2	11	2.8	--	4.8	0.29	0.33	0.63
820409 (South Intake)													
7-7-80	1550	20.0	8.0	T	< 1	< 2	11	2.3	--	--	--	--	--
7-8-80	0745	20.5	7.6	T	--	--	--	--	--	--	--	--	--
7-8-80	1115	20.5	8.0	T	< 1	< 2	10	2.6	--	--	--	--	--

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1 - Values determined in the field at time of sampling.
U - Undetected
T - Trace amount present - actual concentration less than 0.2 which is the quantifiable amount.
Int. - Interference

Table 2 (continued)

Date	Time	Total lead mg/l	Total zinc mg/l	Total iron mg/l	Total mercury mg/l	A-1242 PCB ug/l	A-1254 PCB ug/l	A-1260 PCB ug/l	HCB ug/l	DCP ug/l	HCBD ug/l	DCB ug/l	PCP ug/l	2,4,6,-TCP ug/l
820190 (002)														
7-7-80	2230	< 0.05	< 0.05	0.65	--	--	--	--	< 0.1	< 0.1	< 0.1	< 0.1	T[1]	T
7-8-80	0900	< 0.05	< 0.05	0.91	--	--	--	--	< 0.1	< 0.1	< 0.1	< 0.1	T	< 0.1
820193 (003)														
7-7-80	2350	0.01	< 0.05	0.70	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
7-8-80	0945	0.014	< 0.05	0.84	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	T	< 0.1
820223 (005)														
7-7-80	2400	< 0.005	< 0.05	0.35	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	T	0.[illegible]
7-8-80	1010	< 0.005	< 0.05	1.0	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	T	0.[illegible]
821088 (006)														
7-7-80	2120	< 0.005	< 0.05	0.50	--	--	--	--	--	--	--	--	--	--
7-8-80	1000	< 0.005	< 0.05	0.76	--	--	--	--	--	--	--	--	--	--
820412 (North Intake)														
7-7-80	2215	< 0.05	0.10	0.54	--	--	--	--	--	--	--	--	--	--
7-8-80	0845	< 0.05	< 0.05	0.34	--	--	--	--	--	--	--	--	--	--

Date	Time	Persistant Chlorinated Hydrocarbons ug/l	1,2, Di Chlorinated Propane ug/l	Chloroform ug/l	Aliphatic amines ug/l	HCP ug/l	Other Cl-Phenols ug/l	Other Cl + Br VHC ug/l
820190 (002)								
7-7-80	2230	U	33	3	--	< 0.1	U	U
7-8-80	0900	U	33	3	--	< 0.1	U	U
820193 (003)								
7-7-80	2350	U	13	4	--	< 0.1	U	U
7-8-80	0945	U	10	5	--	< 0.1	U	U
820223 (005)								
7-7-80	2400	U	6	4	--	< 0.1	U	U
7-8-80	1010	U	7	8	--	< 0.1	U	U
821088 (006)								
7-8-80	1000	--	--	--	< 100			
7-8-80	1405	--	--	--	< 100			

T - Trace amount present-actual concentration less than 0.2 which is the quantifiable amount.
HCB - Hexachlorobenzene HCBD - Hexachlorobutadiene TCP - Trichlorophenol
HCP - Hexachlorocyclopentadine DCB - Dichlorobenzidene PCB - Polychlorinated biphenyls
DCP - Dichlorophenol PCP - Pentachlorophenol

Table 3 Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report.

Parameter (Unit)	NPDES Permit Final Limitations Daily Average	NPDES Permit Final Limitations Daily Maximum	July Monthly Operating Report Monthly Average	July Monthly Operating Report Monthly Maximum	July Monthly Operating Report 7-7-80	July Monthly Operating Report 7-8-80	Survey Results[1]
820409 (Intake)							
Suspended solids (mg/l)	--	--	70	115	60	52	(16, 16)
Chlorides (mg/l)	--	--	18	24	--	16	13.5
COD (mg/l)	--	--	24	49	32	--	9 (11, 10)
Total iron (mg/l)	--	--	2.31	2.78	--	--	0.21
BOD_5 (mg/l)	--	--	3	4	--	1	--
820224 (001)							
Flow (M^3/day)	--	--	24,000	27,000	22,000	22,000	21,500
Suspended solids (mg/l)	--	--	30	68	--	13	14 (11, 25)
Ammonia nitrogen (mg/l)	--	--	0.10	0.25	0.25	--	0.23 (0.20, 0.26)
Chlorides (mg/l)	--	--	17	19	18	--	(12.0, 12.5)
COD (mg/l)	--	--	12	17	--	17	7 (8, 10)
pH (S.U.)	not <6.5 nor >9.5		min. 7.7	8.1	7.8	--	(7.7, 7.7)
Residual chlorine (mg/l)	--	--	0.0	0.0	--	0.0	(U, U)
Temperature (°C)	--	--	18	30	--	15	(23.5, 24.0)
820190 (002)							
Flow (M^3/day)	--	--	56,400	62,100	55,300	56,400	55,400
Total suspended solids (kg/day)	844	1,687	1,833	9,543	9,543	507	830
Ammonia nitrogen (mg/l)	1.4	2.3	0.12	0.75	--	--	0.24 (0.22, 0.30)
Chlorides (mg/l)	--	--	30	52	--	31	36. (40., 37)
COD (mg/l)	--	--	22	71	71	--	9 (7, 18)
Total lead (kg/day)	0.6	1.25	0.36	0.467	--	--	--
Residual chlorine (mg/l)	1.0	1.5	0.13	0.82	0.30	0.00	(T, 0.3)
Temperature (°C)	--	--	34	37	33	33	(33.5, 34.0)
pH (S.U.)	not <6.5 nor >9.5		--	10.6 High min. 6.6 Low	10.2 High 7.0 Low	9.6 High 7.4 Low	(7.8, 8.0)

1 - Survey results are for the composite sample. Grab sample ranges are shown in parentheses ( ).
T - Trace
U - Undetected
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Table 3 Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report (continued).

Parameter (Unit)	NPDES Permit Final Limitations		July Monthly Operating Report				Survey Results[1]
	Daily Average	Daily Maximum	Monthly Average	Monthly Maximum	7-7-80	7-8-80	
820193 (003)							
Flow (M^3/day)	--	--	23,700	25,000	23,000	23,000	(23,200)
Total susp. solids (kg/day)	384	768	483	877	415	399	300
Ammonia nitrogen (mg/l)	3	5	0.08	0.88	--	0.88	0.64 (0.61, 0.68)
Total copper (mg/l)	--	1.0	0.016	0.035	0.011	--	< 0.02 (<0.02, <0.02)
Total lead (kg/day)	0.45	0.9	0.34	0.476	--	--	0.2
Total iron (mg/l)	--	1.6	1.733	2.060	--	--	0.78 (0.70, 0.84)
Residual chlorine (mg/l)	1.0	1.5	0.18	0.85	0.14	0.70	(1.05, 1.10, 0.90)
Chlorides (mg;l)	--	--	146	167	--	149	148 (140, 149)
Temperature (°C)	--	--	27	32	26	26	(26.0, 26.5)
pH (S.U.)	not <6.5 nor >9.5		--	10.0 min. 6.4	High 8.7 Low 7.9	High 8.5 Low 7.1	(7.7, 8.0)
820223 (005)							
Flow (M^3/day)	--	--	6,800	7,600	6,100	6,100	4,340
Total susp. solids (mg/l)	35	70	30	358	7	10	27 (6, 19)
Total susp. solids (kg/day)	212	425	200.	2,434	42	60	120
COD (kg/day)	--	821	59	221	130	--	Int.
Ammonia nitrogen (mg/l)	1.0	1.5	0.36	1.38	--	0.62	0.18 (0.15, 0.24)
Chlorides (mg/l)	--	--	6,836	9,372	--	7,480	7,500 (5,400, 8,500)
Total lead (mg/l)	0.1	0.2	0.008	0.010	--	--	< 0.005 (<0.005, <0.005)
Total lead (kg/day)	0.6	1.2	0.050	0.054	--	--	--
Temperature (°C)	--	--	27	31	20	27	(27.0, 30.0)
Residual chlorine (mg/l)	1.0	1.5	0.00	0.05	0.00	0.00	(U, U)
pH (S.U.)	not <6.5 nor >9.5		--	12.4 min. 2.7	High 8.8 Low 7.8	High 8.6 Low 7.5	(7.9, 8.0)

1 - Survey results are for the composite sample. Grab sample ranges are shown in parentheses ( ).
Int - Interference
U - Undetected
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Table 3 Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report. (continued)

Parameter (Unit)	NPDES Permit Final Limitations		July Monthly Operating Report				Survey Results[1]
	Daily Average	Daily Maximum	Monthly Average	Monthly Maximum	7-7-80	7-8-80	
821088 (006)							
Flow (M^3/day)	--	--	26,000	33,000	33,000	32,000	32,500
BOD_5 (kg/day)	173	259	146	606	--	95	490
COD (mg/l)	--	--	13	36	--	16	37 (45, 32)
Total susp. sol.-net (kg/day)	173	259	1,778	2,270.	--	1,650	--
Chlorides-net (kg/day)	--	4,000	260.	722	--	223	160
Ammonia nitrogen (mg/l)	1.5	3.0	0.42	1.80	0.30	--	0.46 (0.38, 0.55)
Ammonia nitrogen (kg/day)	--	114	12.6	58.47	9.75	--	15
Phenol (mg/l)	--	0.2	0.02	0.02	--	0.02	0.009 (<0.005, 0.021)
Phenol (kg/day)	--	4.5	0.508	0.671	--	0.649	0.3
Sulfide (mg/l)	--	--	0.0	0.0	--	--	< 0.01
Total zinc (mg/l)	--	1.0	0.015	0.020	--	--	< 0.05
Temperature (°C)	--	--	26	28	26	--	(28.0, 29.0)
Residual chlorine (mg/l)	--	0.5	0.01	0.10	0.00	--	(U, U)
pH (S.U.)	not <6.5 nor >9.5		--	9.5 min. 7.2	High 8.6 Low 7.7	High 8.2 Low 7.6	(8.6, 8.7)
Total Combined Outfalls							
Chlorides (kg/day)	--	227,000	44,800	63,900	--	49,100	38,000

1 - Survey results are for the composite sample. Grab sample ranges are shown in parentheses ( ).
U - Undetected
To obtain MGD multiply M^3/day by 0.0002642
To obtain lbs/day multiply kg/day by 2.205

Table 4 Comparison of the laboratory analytical results obtained by Pennwalt Chemical Corporation - Wyandotte and the Environmental Protection Bureau from the split composite samples.

Outfalls	820224 (001)		820190 (002)	
	Pennwalt mg/l	E.P.B. mg/l	Pennwalt mg/l	E.P.B. mg/l
Suspended solids	16.0	14	14.7	15
Ammonia nitrogen	0	0.23	0	0.24
COD	1.0	7	7.0	9
Chlorides	--	--	39.5	36
Lead (Pb)	--	--	0.00309	< 0.05
Outfalls	820193 (003)		820223 (005)	
	Pennwalt mg/l	E.P.B. mg/l	Pennwalt mg/l	E.P.B. mg/l
Suspended solids	17.5	13	17.5	27
Ammonia nitrogen-N	0	0.64	0	0.18
COD	--	--	5.2	Interference
Chlorides	149.5	148	7,117.4	7,500
Copper	0.006903	<0.02	--	--
Lead	0.00456	0.009	0.0124	< 0.005
Iron	0.77	0.78	--	--
	821088 (006)		820412 (Intake)	
	Pennwalt mg/l	E.P.B. mg/l	Pennwalt mg/l	E.P.B. mg/l
Suspended solids	3.5	8	8.7	6
Ammonia nitrogen-N	0.7	0.46	--	--
BOD5	16.2	15	3.6	3.5
COD	36.0	37	10.9	9
Chlorides	25.2	21	48.1	26
Sulfide	0	< 0.01	--	--
Phenol	< 0.020	0.009	--	--
Zinc	0.021	< 0.05	--	--
Iron	--	--	0.37	0.52

Pennwalt Chemical Corporation - Wyandotte

Table 5 Comparison of the previous survey results with the results obtained in this survey.

Outfalls		820224 (001)		820190 (002)	
Survey Date	From	11-6-78	7-7-80	11-6-78	7-7-80
	To	11-7-78	7-8-80	11-7-78	7-8-80
Flow Rate (M^3/day)		19,000	21,500	42,500	55,400
		mg/l	mg/l	mg/l	mg/l
Suspended solids		25	14	14	15
Dissolved solids		170	160	200	200
COD		26	7	9	9
Phenol		< 0.01	0.007	0.03	< 0.005
Nitrite & nitrate nitrogen-N		0.35	0.36	0.32	0.32
Ammonia nitrogen-N		0.39	0.23	0.32	0.24
Total phosphorus-P		0.22	0.07	0.07	0.09
Chlorides		--	--	30	36
Total lead (Pb)		--	--	< 0.005	< 0.05
Total zinc (Zn)		--	--	0.048	< 0.05
Total iron (Fe)		1.3	0.76	0.72	0.77

Pennwalt Chemical Corporation - Wyandotte

Table 5 (continued)

Outfalls	820193 (003)		820223 (005)	
Survey Date From	11-6-78	7-7-80	11-6-78	7-7-80
To	11-7-78	7-8-80	11-7-78	7-8-80
Flow Rate (M^3/day)	22,400	23,200	4,700	4,340
	mg/l	mg/l	mg/l	mg/l
Suspended solids	19	13	32	27
Dissolved solids	390	390	64,000	16,000
COD	14	11	20	Interference
Phenol	< 0.01	0.007	< 0.01	< 0.005
Nitrite & nitrate nitrogen-N	0.38	0.47	0.71	0.41
Ammonia nitrogen-N	2.9	0.64	0.65	0.18
Total phosphorus-P	0.16	0.17	0.22	0.05
Chlorides	136	148	32,000	7,500
Total chromium (Cr)	--	--	0.006	< 0.05
Total copper (Cu)	0.020	< 0.02	0.003	0.03
Total nickel (Ni)	--	--	--	--
Total lead (Pb)	0.009	0.009	< 0.005	< 0.005
Total zinc (Zn)	--	--	< 0.005	< 0.05
Total iron (Fe)	1.2	0.78	0.017	0.59

Pennwalt Chemical Corporation - Wyandotte

Table 5 (Continued)

Outfalls	821088 (006)		820412 (Intake)	
Survey Date From	11-6-78	7-7-80	11-6-78	7-7-80
To	11-7-78	7-8-80	11-7-78	7-8-80
Flow Rate (M^3/day)	29,000	32,500	--	--
	mg/l	mg/l	mg/l	mg/l
Suspended solids	15	8	12	6
Dissolved solids	570	160	160	400
COD	47	37	10	9
Phenol	0.15	0.009	--	--
Sulfide (S)	0.05	< 0.01	--	--
BOD_5	33	15	4.3	3.5
Nitrite & nitrate nitrogen-N	0.33	0.34	0.28	0.30
Ammonia nitrogen-N	0.65	0.46	0.39	0.27
Total phosphorus-P	0.10	0.08	0.07	0.08
Chlorides	28	21	22	26
Total lead (Pb)	< 0.005	< 0.005	--	--
Total zinc (Zn)	0.040	< 0.05	0.009	< 0.05
Total iron (Fe)	9.2	0.57	0.31	0.52

Table 6 Sample Preservation

Parameter	Preservative
COD/TOC/phenol (Chlorine absent)	10 drops conc. H_2SO_4/250 ml (to pH <2).
Phenols (Chlorine present)	Dechlorinated w/ferrous ammonium sulfate (0.141 N) 1 drop/mg/l Cl_2/250 ml. H_2SO_4 to pH <2.
Total Metals	2 ml 1:1 HNO_3/250 ml (to pH <2).
Oil & Grease	10 drops conc. H_2SO_4/250 ml (to pH <2).
Sulfides	10 drops 1M ZnAc/250 ml.
& base-neutral extractables	Dechlorinated (if needed) with sodium thiosulfate (1 drop 0.141 N/mg/l Cl_2/250 ml).

All samples cooled to 4°C and preserved upon collection and chain of custody maintained.

Survey by: Gary Boersen, Environmental Engineer
Elizabeth Browne, Water Quality Technician
William Erickson, Water Quality Technician
Guntis Kalejs, Water Quality Technician
Bruce Walker, Water Quality Technician

Contact with Management: John Lewis, Supervisor of Environmental Control & Certified Operator
Tom Overgaard, Senior Chemist - East Plant
Chuck Talcot, Lab Supervisor - West Plant

Hydrocarbon Analyses by: Environmental Protection Bureau Laboratory

Physical, Chemical & Bacteriological Analyses by: Environmental Protection Bureau Laboratory

Report by: Gary Boersen
William Erickson
Point Source Studies Section
Environmental Services Division
Environmental Protection Bureau
Michigan Dept. of Natural Resources

Distribution "A"
21

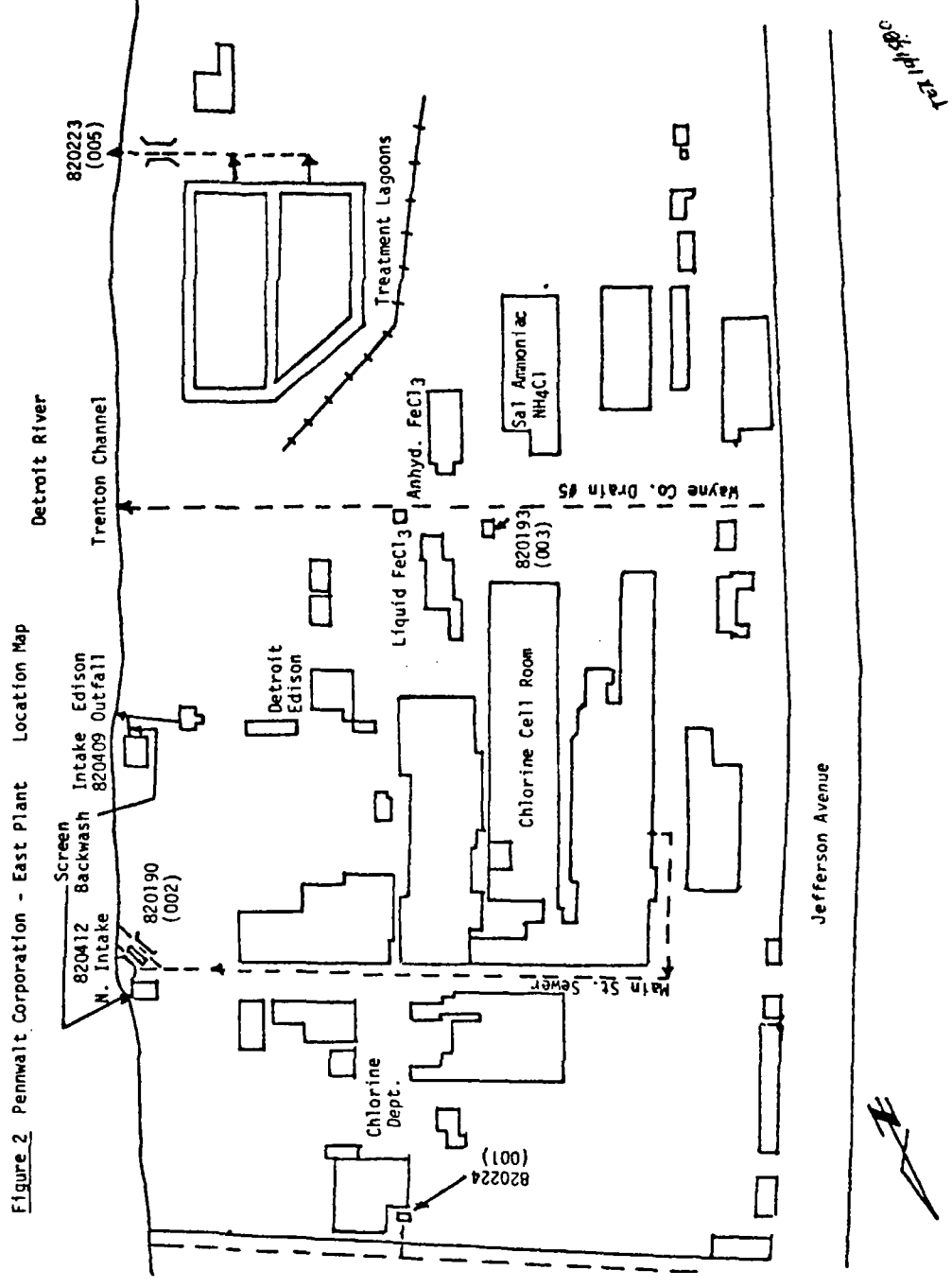


Figure 2 Pennwalt Corporation - East Plant Location Map

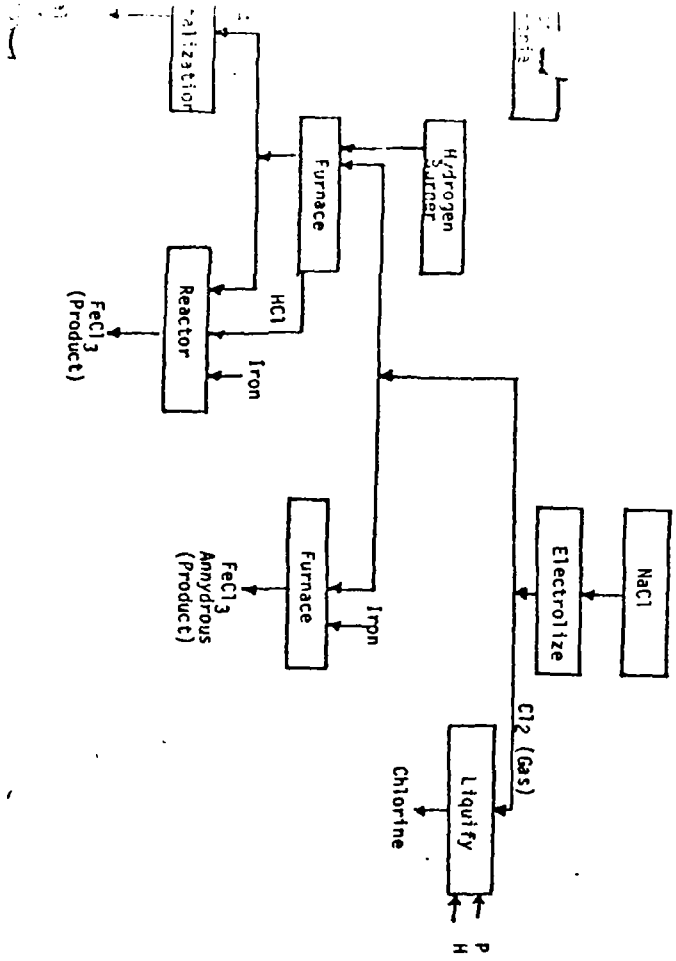
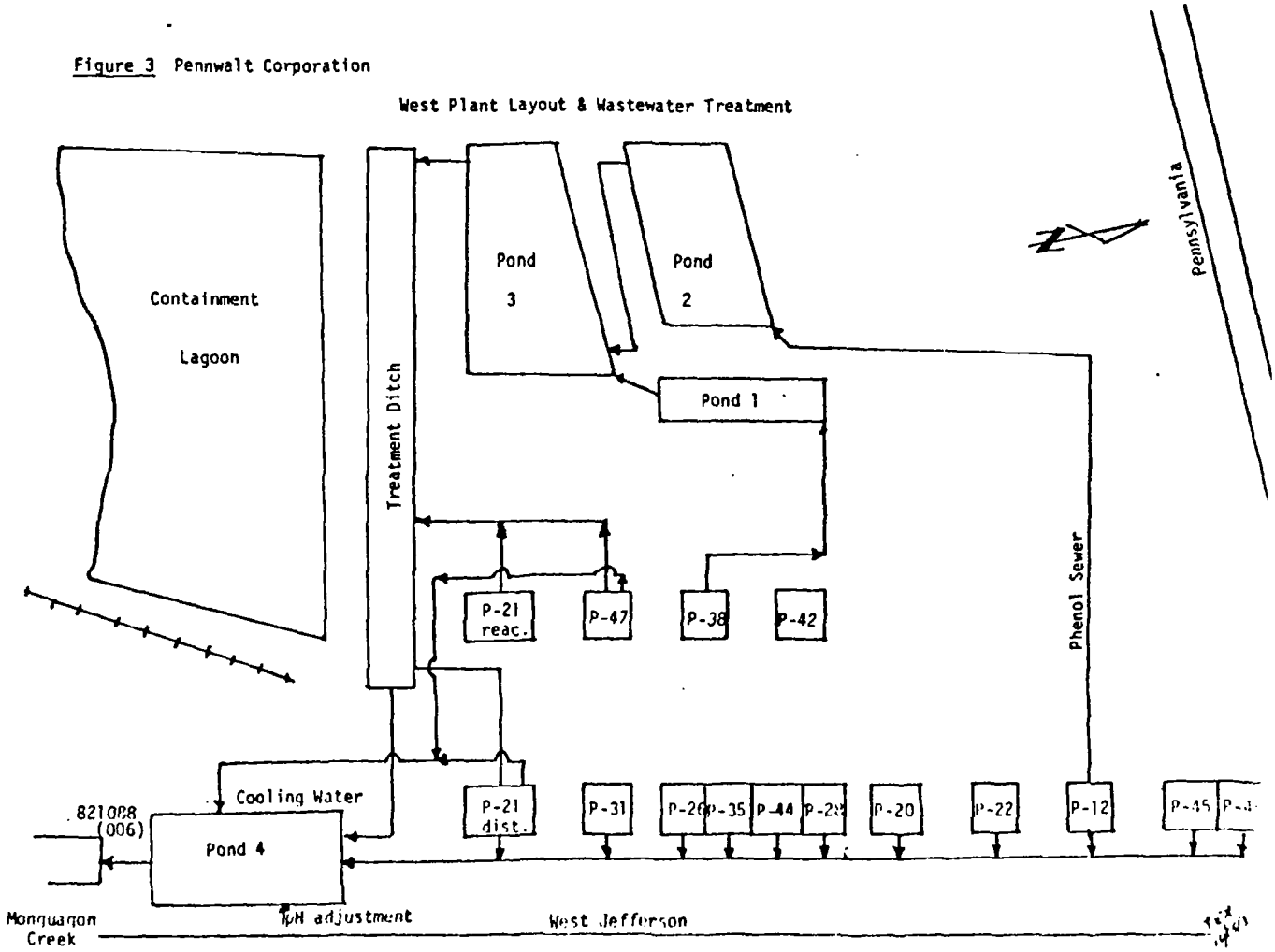


Figure 1 Pennwalt Corporation - East Plant

Process Flow Diagram

Figure 3 Pennwalt Corporation

West Plant Layout & Wastewater Treatment



U. S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
CHEMICAL INFORMATION DIVISION

7/18/1980

PENNWALT CORPORATION (001283Z)
4655 BIDDLE AVENUE
WYANDOTTE MI 48192

75-04-7 Ethanamine
MANUFACTURER

75-31-0 2-Propanamine
MANUFACTURER

75-75-2 Methanesulfonic acid
MANUFACTURER
1977 PRODUCTION OF 1 MILLION TO TEN MILLION POUNDS

80-46-6 Phenol, 4-(1,1-dimethylpropyl)-
MANUFACTURER

95-30-7 Carbamodithioic acid, diethyl-, 2-benzothiazolyl ester
MANUFACTURER

96-80-0 Ethanol, 2-[bis(1-methylethyl)amino]-
MANUFACTURER

97-77-8 Thioperoxydicarbonic diamide, tetraethyl-
MANUFACTURER

100-37-8 Ethanol, 2-(diethylamino)-
MANUFACTURER

102-69-2 1-Propanamine, N,N-dipropyl-
MANUFACTURER

U. S. ENVIRONMENTAL PROTECTION AGENCY
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CHEMICAL INFORMATION DIVISION

7/18/1980

PENNWALT CORPORATION (001283Z)

102-79-4 Ethanol, 2,2'-(butylimino)bis-
MANUFACTURER

102-81-8 Ethanol, 2-(dibutylamino)-
MANUFACTURER

102-82-9 1-Butanamine, N,N-dibutyl-
MANUFACTURER

102-86-3 1-Hexanamine, N,N-dihexyl-
MANUFACTURER

105-55-5 Thiourea, N,N'-diethyl-
MANUFACTURER

105-59-9 Ethanol, 2,2'-(methylimino)bis-
MANUFACTURER

107-10-8 1-Propanamine
MANUFACTURER

108-01-0 Ethanol, 2-(dimethylamino)-
MANUFACTURER

108-09-8 2-Pentanamine, 4-methyl-
MANUFACTURER

108-16-7 2-Propanol, 1-(dimethylamino)-
MANUFACTURER

U. S. ENVIRONMENTAL PROTECTION AGENCY
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CHEMICAL INFORMATION DIVISION

7/18/1980

PENNWALT CORPORATION (001283Z)

108-18-9	2-Propanamine, N-(1-methylethyl)- MANUFACTURER
109-46-6	Thiourea, N,N'-dibutyl- MANUFACTURER
109-56-8	Ethanol, 2-[(1-methylethyl)amino]- MANUFACTURER
109-73-9	1-Butanamine MANUFACTURER
109-83-1	Ethanol, 2-(methylamino)- MANUFACTURER
109-89-7	Ethanamine, N-ethyl- MANUFACTURER
110-58-7	1-Pentanamine MANUFACTURER
110-73-6	Ethanol, 2-(ethylamino)- MANUFACTURER
110-77-0	Ethanol, 2-(ethylthio)- MANUFACTURER
111-26-2	1-Hexanamine MANUFACTURER

U. S. ENVIRONMENTAL PROTECTION AGENCY
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CHEMICAL INFORMATION DIVISION

7/18/1980

PENNWALT CORPORATION (001283Z)

111-92-2 1-Butanamine, N-butyl-
MANUFACTURER

120-95-6 Phenol, 2,4-bis(1,1-dimethylpropyl)-
MANUFACTURER

121-44-8 Ethanamine, N,N-diethyl-
MANUFACTURER

121-93-7 Ethanol, 2,2'-[(1-methylethyl)imino]bis-
MANUFACTURER

123-82-0 2-Heptanamine
MANUFACTURER

124-63-0 Methanesulfonyl chloride
MANUFACTURER

128-04-1 Carbamodithioic acid, dimethyl-, sodium salt
MANUFACTURER
1977 PRODUCTION OF 1 MILLION TO TEN MILLION POUNDS

136-23-2 Zinc, bis(dibutylcarbamodithioato-S,S')-, (T-4)-
MANUFACTURER

137-26-8 Thioperoxydicarbonic diamide, tetramethyl-
MANUFACTURER

137-30-4 Zinc, bis(dimethylcarbamodithioato-S,S')-, (T-4)-
MANUFACTURER

PENNWALT CORPORATION (001283Z)

139-87-7 Ethanol, 2,2'-(ethylimino)bis-
MANUFACTURER

140-82-9 Ethanol, 2-[2-(diethylamino)ethoxy]-
MANUFACTURER

142-84-7 1-Propanamine, N-propyl-
MANUFACTURER

143-16-8 1-Hexanamine, N-hexyl-
MANUFACTURER

148-18-5 Carbamodithioic acid, diethyl-, sodium salt
MANUFACTURER

513-49-5 2-Butanamine, (S)-
MANUFACTURER

621-77-2 1-Pentanamine, N,N-dipentyl-
MANUFACTURER

1310-73-2 Sodium hydroxide
MANUFACTURER
1977 PRODUCTION OF 100 MILLION TO 500 MILLION POUNDS

1333-74-0 Hydrogen
MANUFACTURER
1977 PRODUCTION OF 100 MILLION TO 500 MILLION POUNDS

1561-75-7 Disulfide, dihexadecyl
MANUFACTURER

PENNWALT CORPORATION (001283Z)

1704-62-7 Ethanol, 2-[2-(dimethylamino)ethoxy]-
MANUFACTURER

2386-60-9 1-Butanesulfonyl chloride
MANUFACTURER
1977 PRODUCTION OF 0 TO 1000 POUNDS

3710-84-7 Ethanamine, N-ethyl-N-hydroxy-
MANUFACTURER

6088-51-3 2-Naphthalenol, 6,6'-dithiobis-
MANUFACTURER

6735-35-9 Ethanol, 2,2'-(propylimino)bis-
MANUFACTURER
1977 PRODUCTION OF 0 TO 1000 POUNDS

7440-50-8 Copper
MANUFACTURER
1977 PRODUCTION OF 10,000 TO 100,000 POUNDS

7647-01-0 Hydrochloric acid
MANUFACTURER
1977 PRODUCTION OF FIFTY MILLION TO 100 MILLION POUNDS

7782-50-5 Chlorine
MANUFACTURER
1977 PRODUCTION OF 100 MILLION TO 500 MILLION POUNDS

7783-06-4 Hydrogen sulfide
MANUFACTURER

10043-52-4 Calcium chloride
MANUFACTURER
1977 PRODUCTION OF 100,000 TO 1,000,000 POUNDS

U. S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
CHEMICAL INFORMATION DIVISION

7/18/1980

PENNWALT CORPORATION (001283Z)

12125-02-9 Ammonium chloride
MANUFACTURER
1977 PRODUCTION OF TEN MILLION TO FIFTY MILLION POUNDS

13360-63-9 1-Butanamine, N-ethyl-
MANUFACTURER

13472-30-5 Silicic acid, tetrasodium salt
MANUFACTURER
1977 PRODUCTION OF TEN MILLION TO FIFTY MILLION POUNDS

16369-21-4 Ethanol, 2-(propylamino)-
MANUFACTURER

16721-80-5 Sodium sulfide
MANUFACTURER
1977 PRODUCTION OF 0 TO 1000 POUNDS

21035-44-9 2-Butanamine, N-ethyl-
MANUFACTURER
1977 PRODUCTION OF 0 TO 1000 POUNDS

33373-80-7 Oxazolidine, 2-(trichloromethyl)-
MANUFACTURER
PRODUCTION OF 1000 TO 10,000 POUNDS

57883-06-4 2-Butanamine, 1-methoxy-, (R)-
MANUFACTURER

PENNWALT CORPORATION

4655 BIDDLE AVENUE, WYANDOTTE, MICHIGAN 48192 · (313) 285-9200

December 30, 1980

Mr. Robert J. Courchaine
Chief, Water Quality Division
Department of Natural Resources
Stevens T. Mason Bldg.
Box 30028
Lansing, MI 48909

Dear Mr. Courchaine:

Listed below by process are the products which remain to be sampled and analyzed as part of Pennwalt's Waste Characterization study.

Process	Product
21	Propylamines Butylamines
26	Diethylthiourea Ethylbutylthiourea
28	Sodium Hydrosulfide
31	Hexylamines
35	Hexylamines
38	Endothall
46	Methane Sulfonyl Chloride Methane Sulfonic Acid
47	Dimethylamino-2-propanol Isopropylaminoethanols

Process	Product
Pilot Plant	Hexadecyldisulfide Diethylhydroxylamine
Building 26	Sodium Methane Sulfonate Alkylamines and Amylphenol

The following washout has been completed:

Process	Product
45	Triethylamine Triethylamine Oxide Diethylhydroxylamine Phosphorous - Total

Sincerely,

PENNWALT CORPORATION

J. E. Rhodes
Manager, Technical Department

cc: Paul Zugger
David Batchelor
Roy Schrameck

JER:blw

CORPORATION

4655 BIDDLE AVENUE, WYANDOTTE, MICHIGAN 48192 · (313) 285-9200

December 30, 1980

Mr. Robert J. Courchaine
Chief, Water Quality Division
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Process	Product
21	Propylamines Butylamines
26	Diethylthiourea Ethylbutylthiourea
28	Sodium Hydrosulfide
31	Hexylamines
35	Hexylamines
38	Endothall
46	Methane Sulfonyl Chloride Methane Sulfonic Acid
47	Dimethylamino-2-propanol Isopropyl[illegible]ethanol's

Process	Product
Pilot Plant	Hexadecyldisulfide Diethylhydroxylamine
Building 26	Sodium Methane Sulfonate Alkylamines and Amylphenol

The following washout has been completed:

Process	Product
45	Triethylamine Triethylamine Oxide Diethylhydroxylamine Phosphorous - Total

Sincerely,

PENNWALT CORPORATION

J. E. Rhodes
Manager, Technical Department

cc: Paul Pugger
David Batchelor
Roy Schraneck

Public

STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES

WATER RESOURCES COMMISSION

IN THE MATTER OF ABATEMENT OF WATER POLLUTION: Pennwalt Corp. Wyandotte, Michigan

NPDES PERMIT NO. MI 0002381
FINAL ORDER NO.

FINAL ORDER OF ABATEMENT

At a session of the Water Resources Commission on _____ 1980, at _____, Michigan, upon presentation by staff of the Water Quality Division, and based upon the official files of the Water Resources Commission:

IT IS THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that Pennwalt Corporation was issued National Pollutant Discharge Elimination System (NPDES) Permit No. MI 0002381 on June 20, 1975, for its Wyandotte facility in Wyandotte, Michigan. Said Permit was revised March 3, 1976, and again May 21, 1976.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, the Federal Clean Water Act of 1977 (P.L. 95-217), which amended the Federal Water Pollution Control Act amendments of 1972 (P.L. 92-500), and the Michigan Water Resources Commission Act (Act 245, P.A. 1929 as amended), require that by no later than July 1, 1977, all discharges to the surfaces waters of the State of Michigan have waste treatment facilities installed and operating, which conform with Best Practicable Control Technology Currently Available (B.P.C.T.C.A.) as defined by the United States Environmental Protection Agency (U.S. EPA) and any more stringent limitations necessary to meet the water quality standards of the State of Michigan.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that NPDES Permit No. MI 0002381 contained final effluent limitations and a schedule of compliance to achieve those limitations by July 1, 1977.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that although Pennwalt Corporation complied with portions of the schedule of compliance, the company violated the terms and conditions of NPDES Permit No. MI 0002381 by its continued inability to achieve effluent limitations specified within the permit.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and Michigan Department of Natural Resources, that as a result of these continuing violations, a Final Order of Abatement, Final Order No. 1931 was entered in October 1977. Under provisions of the Final Order, Pennwalt Corporation immediately paid as liquidated damages the sum of one hundred fifty thousand dollars ($150,000.00) to the general fund of the State of Michigan. Additionally, the Final Order modified the schedule of compliance contained in NPDES Permit No. MI 0002381, allowing an extension of time for achieving compliance to October 1, 1977, for Outfall 002, to April 1, 1978, for Outfalls 003 and 005, and to February 1, 1978, for Outfall 006.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that Pennwalt Corporation failed to attain the operational level necessary to meet the effluent limitations specified in Final Order No. 1931 in accordance with the schedule outlined therein.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that under provisions of Final Order 1931, specific to violations of final effluent limitations after required compliance dates, Pennwalt Corporation contemporaneously made payments of liquidated damages totaling an additional one hundred eighty thousand dollars ($180,000.00). Subsequent violations of the final effluent limitations were violations of the Final Order for which the State could seek other and further relief.

IT IS THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that in accordance with Part 5 Rules of the General Rules of the Water Resources Commission that Pennwalt Corporation is required to submit and implement a Pollution Incident Prevention Plan.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that Pennwalt Corporation submitted a revised Pollution Incident Prevention Plan (PIPP) November 16, 1979 and that said plan included a proposed implementation schedule for construction of additional containment facilities for both the East and West Plants.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the pH limitations contained in the United States Environmental Protection Agency (EPA) promulgated guidelines for the Inorganic Chemical industry subcategory, dated March 12, 1974 and May 22, 1975, are not applicable to the Pennwalt facilities.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the Company continuously measures pH at all its process wastewater discharges.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the EPA document entitled BACKGROUND DOCUMENT FOR MODIFICATION OF PH EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR POINT SOURCES REQUIRED BY NPDES PERMIT TO MONITOR CONTINUOUSLY EFFLUENT PH published November 1980 states "pH standards (6.0-9.0) whenever final effluent pH is required to be measured continuously may be beyond the capabilities of BPT and BCT systems."

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Department of Natural Resources, that, as evidenced by the Company's December 18, 1979, demonstration of their existing pH control facilities, the pH limitations contained in this Final Order are appropriate.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that compliance with the pH limitations contained in this Final Order will insure full protection of the State's water quality standards and will protect the State's waters against pollution, impairment, or destruction.

IT IS AGREED BY ALL PARTIES, the Department of Natural Resources, the Water Resources Commission, and Pennwalt Corporation, that in the absence of effective guideiines for pH, it is the judgment of the parties that the pH control facilities installed by the Company constitute Best Practicable Control Technology Currently Available (B.P.C.T.C.A.). The parties also recognize that the United States Environmental Protection Agnecy (EPA) has neither made a final determination on this issue nor authorized the inclusion of the pH limitations contained herein in a revised NPDES permit for Pennwalt, and that a final determination by EPA on this issue may require modification of this Final Order or the NDPES permit. In this event, either party may seek such modification.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the Company has reviewed this Consent Order and while neither admitting nor denying that litigation of the issues would have resulted in a finding of the violations referred to in this Order or award of the damages set forth in this Order, has agreed to its entry as a Final Order of the Water Resources Commission.

IT IS THEREFORE ORDERED that Final Order of Abatement No. 1931 entered on October 14, 1977 is hereby rescinded.

IT IS FURTHER ORDERED that NPDES Permit No. MI 0002381 issued on June 20, 1975, as subsequently revised, is in full force and effect except that compliance with Section A of this Final Order constitutes compliance with Part I, Section A of the NPDES permit until NPDES Permit No. MI 0002381 is reissued, suspended, rescinded or revoked.

SECTION A EFFLUENT CONDITIONS AND MONITORING REQUIREMENTS

IT IS FURTHER ORDERED that Pennwalt Corporation shall comply with the following restrictions and conditions:

1. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of eight million one hundred thousand (8,100,000) gallons per day of noncontact cooling water from Outfall 001. Such discharge shall be limited and monitored by the permittee as specified below:

	Discharge Limitations kg/day (lbs/day)		Other Limitations		Monitoring Requirements	
Effluent Characteristics	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3x Weekly	
Total Suspended Solids					Weekly	Grab
Total Residual Chlorine					Weekly	Grab
Ammonia (as N)					Weekly	Grab
Chlorides					Weekly	Grab
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Weekly	Reading
COD					Weekly	Grab

The term noncontact cooling water shall mean water used for cooling which does not come into direct contact with any raw material, intermediate product, by product, waste product, or finished product.

a. The pH shall not be less than 6.0 nor greater than 9.0. The pH shall be monitored as follows: weekly; grab.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 001 prior to discharge to Wye Street storm sewer.

e. In the event the permittee shall require the use of Water Treatment additives the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1 of NPDES Permit No. MI 0002381.

2. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of seventeen million nine hundred thousand (17,900,000) gallons per day of contact cooling water, process water, and noncontact cooling water from Outfall 002. Such discharge shall be limited and monitored by the permittee as specified below:

	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Limitations			
Effluent Characteristic	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3x Weekly	
Chlorides					3x Weekly	24 Hr. Comp.
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Daily	Reading
COD					3x Weekly	24 Hr. Comp.
Total Suspended Solids	4103(9046)	8206(18092)			5x Weekly	Grab
Ammonia (as N)			1.4 mg/l	2.3 mg/l	3x Weekly	24 Hr. Comp.
Total Residual Chlorine			1.0 mg/l	1.5 mg/l	Daily	Grab
Total Lead	0.6(1.37)	1.25(2.75			Twice Monthly	24 Hr. Comp.

The term noncontact cooling water shall mean water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product, or finished product.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 5.0 to 10.0, 95% of the time; within the range of 3.0 to 11.0, 99% of the time; within the range of 2.0 to 12.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous; report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 002 prior to discharge to the Detroit River.

e. In the event the permittee shall require the use of Water Treatment additives, the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1 of NPDES Permit No. MI 0002381.

3. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of nine million eight hundred thousand (9,800,000) gallons per day of contact cooling water, process water, including waste water from the cell room, and noncontact cooling water from Outfall 003. Such discharge shall be limited and monitored by the permittee as specified below:

	Discharge Limitations					
	kg/day (lbs/day)		Other Limitations		Monitoring Requirements	
Effluent Characteristics	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3x Weekly	
Chlorides					3x Weekly	24 Hr. Comp.
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Daily	Reading
Total Suspended Solids	1481(3266)	2963(6532)			5x Weekly	Grab
Ammonia (as N)			3 mg/l	5 mg/l	3x Weekly	24 Hr. Comp.
Total Copper				1.0 mg/l	Twice Monthly	24 Hr. Comp.
Total Lead	0.45(1.0)	0.9(2.0)			Twice Monthly	24 Hr. Comp.
Total Residual Chlorine			1.0 mg/l	1.5 mg/l	Daily	Grab

The term noncontact cooling water means water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product, or finished product.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 6.0 to 11.0, 99% of the time; and within the range of 2.0 to 11.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous; report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 003 prior to discharge to the Detroit River.

e. In the event the permittee shall require the use of Water Treatment additives, the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1 of NPDES Permit No. MI 0002381.

4. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of two million three hundred thousand (2,300,000) gallons per day** of process water, including ferric chloride process water from Outfall 005. Such discharge shall be limited and monitored by the permittee as specified below:

	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)**		Other Limitations			
Effluent Characteristics	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					Continuous	
Total Suspended Solids*	212(467)	425(934)	35 mg/l	70 mg/l	5x Weekly	Grab
COD		821(1801)			3x Weekly	24 Hr. Comp.
Ammonia (as N)			1.0 mg/l	1.5 mg/l	3x Weekly	24 Hr. Comp.
Total Residual Chlorine			1.0 mg/l	1.5 mg/l	Daily	Grab
Chlorides					3x Weekly	24 Hr. Comp.
Total Lead	0.6(1.4)	1.2(2.7)	0.1 mg/l	0.2 mg/l	Twice Monthly	24 Hr. Comp.
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Daily	Reading

* The above limitations for Total Suspended Solids may be modified to net value upon demonstration to the Chief of the Water Quality Division of the Michigan Department of Natural Resources that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4 of NPDES Permit No. MI 0002381.

** kg/day (lbs/day) values are not related to flow volume.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 5.0 to 10.0, 95% of the time; within the range of 3.0 to 11.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous - report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 005 prior to mixing with effluent from the Wyandotte-Wayne waste water treatment plant.

5. Final Effluent Limitations - Total Chloride Loading

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge contact cooling water, barometric condenser water, noncontact cooling water and process water from Outfalls 001, 002, 003, and 005. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Total Combined Outfalls 001, 002, 003 and 005:			
Chlorides*	227,000(500,000)	3x Weekly	Calculati

* The above limitations for chlorides may be modified to a net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4 of NPDES Permit No. MI 0002381.

6. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of ten million (10,000,000) gallons per day* of noncontact cooling water, barometric condenser water and process water from Outfall 006. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day(lbs/day)* Monthly Average	Daily Maximum	Other Limitations Monthly Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3x Weekly	
BOD_5	661(1457)	967(2133)			3x Weekly	24 Hr. Comp.
COD					3x Weekly	24 Hr. Comp.
Total Suspended Solids	173(380) (net)	259(570) (net)			3x Weekly	24 Hr. Comp.
Chlorides		4000(8800) (net)			3x Weekly	24 Hr. Comp.
Ammonia (unionized)				0.2 mg/l	3x Weekly	Grab
Total Residual Chlorine				0.5 mg/l	3x Weekly	Grab
Phenol		4.5(10)		0.2 mg/l	3x Weekly	24 Hr. Comp.
Sulfide					Weekly	24 Hr. Comp.
Temperature					3x Weekly	Reading
Oil & Grease			No Visible Film		Daily	Visual Observation
Total Zinc				1.0 mg/l	Twice Monthly	24 Hr. Comp.

* kg/day (lbs/day) values are not related to the flow volume.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 6.0 to 10.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous - report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 006 prior to discharge to Monguagon Creek.

7. Intake Monitoring Requirements

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee shall monitor the intake as specified below:

	Monitoring Requirements	
Characteristic	Measurement Frequency	Sample Type
BOD_5	Weekly	24 Hr. Comp.
Total Suspended Solids	5x Weekly	24 Hr. Comp.
Chlorides	3x Weekly	24 Hr. Comp.
COD	3x Weekly	24 Hr. Comp.

a. Samples taken in compliance with the monitoring requirements above shall be taken of the intake after initial screening.

8. Limitations, Monitoring and Reporting Requirements for Deep Disposal Well

Beginning upon the issuance of this Final Order and lasting until the expiration of authorization of this Final Order the permittee shall dispose of previously authorized wastewaters into an approved strata by means of disposal wells which shall be equipped, tested, and operated in conformance with the requirements of the Mineral Wells Act, Act 315, Public Acts of 1929 and Act 245, Public Acts of 1929, as amended, and the rules promulgated thereunder. The company shall submit to the Chief of the Water Quality Division and obtain his approval of its contingency plan for periods of outage of the deep well disposal system. Any outage of the deep well disposal system shall be immediately reported to the Chief of the Water Quality Division and the Geological Survey Division Supervisor of Waste Disposal Wells.

Monitoring Requirements for Deep Well Disposal

PARAMETER	LIMITS	FREQUENCY	TYPE
Wellhead Pressure	(None set)	Weekly	Psig
Flow Rate		Weekly	GPM (Pump Rate)
Flow Total		Monthly	MG/MON (Last day)
Total Suspended Solids		Weekly	#/1000 gal (Grab)

The disposal to the deep well is limited to currently authorized discharges. Any new discharges to the deep well shall be done in accordance with Part II-A-1 of NPDES Permit No. MI 0002381.

The above authorization pertains to the deep well disposal units as permitted by the Geological Survey Division of the Michigan Department of Natural Resources.

Mineral Well Permit No.	Well No.
049-736-882	4-049
048-736-882	6-048
047-736-882	15-047

Reporting Requirements for Deep Well Disposal

The permittee shall comply with the following reporting in accordance with the schedule under C of NPDES Permit No. MI 0002381, Schedule of Compliance - Deep Well Disposal.

a. Submit contingency plans for periods of outage.

b. Submit a completed Michigan Discharge Permit Application and a "Well and Reservoir Data on Underground Industrial Waste Disposal Systems" form (as approved by the Geological Survey Division of the Department of Natural Resources) for each disposal well to the Chief of the Water Quality Division Department of Natural Resources on or before N/A.

Review of the discharge(s) to the deep disposal well(s) will be made upon receipt of the application. Any modification in the disposal well requirements of the permit will be made in accordance with Part II-B-4 of NPDES Permit No. MI 0002381.

SECTION B POLLUTION INCIDENT PREVENTION PLAN

IT IS FURTHER ORDERED that Pennwalt Corporation implement the approved Pollution Incident Prevention Plan in accordance with the following schedule:

1. West Plant

a. Secondary Containment (Diked Tanks)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by November 1, 1981.

b. Spillage Containment (Tank Car and Tank Trailer Building No. 49 Unloading/Loading)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by August 1, 1981.

c. Spillage Drainage Prevention (Tank Car and Tank Trailer Loading/Unloading)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by October 1, 1981.

d. In-Process Containment Facilities (Sump and Valves)
1.) Submittal and approval of a final design, typical of the facilities to be constructed, by March 1, 1981.

2.) Complete construction by June 1, 1982.

e. Vacuum Trailer
1.) A vacuum trailer is on site and operational.

2. East Plant

a. Secondary Containment (Diked Tanks)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by August 1, 1981.

b. Secondary Spill Prevention (Dry Moats)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by November 1, 1981.

c. Alternate Containment Program (Undiked Tanks-Plugs)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by October 1, 1981.

d. Spillage Containment (Tank Trailer Unloading)
1.) The Company has submitted and received approval of final design, typical of the facilities to be constructed.
2.) Complete construction by September 1, 1981.

e. Spillage Drainage Prevention (Tank Car and Tank Trailer)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by August 1, 1981.

f. Alternate Containment Program (In-Process)
1.) Submittal and approval of a final design, typical of the facilities to be constructed, by June 1, 1981.

2.) Complete construction by September 1, 1982.

g. Liquid Ferric Sludge (Defluidizing Pad)
1.) Submittal and approval of a final design, typical of the facilities to be constructed, by April 1, 1981.

2.) Complete construction by September 1, 1981.

No later t[illegible] 14 calendar days following any of t[illegible] dates for completion of construction identified in the above schedule of compliance, the Company shall submit a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken and the projected date for completion of construction.

IT IS FURTHER ORDERED that Pennwalt Corporation submit progress reports on or before July 1, 1981, January 1, 1982, July 1, 1982, and January 1, 1983 regarding the status of implementation of the Pollution Incident Prevention Plan.

SECTION C PROCESS WASTEWATER CHARACTERIZATION STUDY

Pennwalt Corporation shall conduct a Process Wastewater Characterization Study in accordance with Attachment "A" hereto in accordance with the following:

1. Submit an approvable schedule to implement the Wastewater Characterization Study, Attachment "A" to the Chief of the Water Quality Division on or before July 31, 1980. The Company has submitted a schedule which is under review.

2. Submit a listing of parameters by process, for which analytical procedures are currently not available, to the Chief of the Water Quality Division on or before July 31, 1980. The Company has submitted this listing.

3. Submit an approvable detailed analytical procedure for each parameter identified in 2. above to the Chief of the Water Quality Division by date of entry of this Final Order, except as provided in 4. below. The analytical procedures approved by the Chief of the Water Quality Division shall be utilized in the process wastewater characterization study. The Company has submitted a proposed analytical procedure for the lower alkylamines through di-n-butylamine which is under review.

4. Where analytical procedures cannot be developed for any parameter(s) the Company shall submit detailed documentation of attempts to develop such procedure(s) and a proposal for additional research to accomplish same, including an implementation schedule, to the Chief of the Water Quality Division on or before February 28, 1981. Any additional research to develop analytical procedures must receive the approval of the Chief of the Water Quality Division. Termination of attempts to develop analytical procedures must receive the approval of the Chief of the Water Quality Division.

5. Submit a progress report to the Chief of the Water Quality Division detailing the actions the Company has taken to comply with this section. Said report shall be submitted by no later than February 28, 1981.

6. Submit the results of the Process Wastewater Characterization Study to the Chief of the Water Quality Division on or before April 30, 1981.

SECTION D CONCLUSION

IT IS AGREED that the entry of this Final Order is in settlement for violations of NPDES Permit No. MI 0002381 and Final Order of Abatement F.O. 1931. The entry of this Final Order completes the Company's obligations under the Final Order No. 1931 and supercedes and rescinds Final Order No. 1931.

The Pennwalt Corporation agrees that but for this Final Order, the Company might be subject to the civil penalty provisions provided by law for failure of the Company to be in full compliance with the terms and conditions of NPDES Permit No. MI 0002381 and Final Order of Abatement No. 1931. The Pennwalt Corporation and the Department hereby agree that the $150,000 liquidated damages paid on October 10, 1977, and the liquidated damages payments paid pursuant to Final Order No. 1931 totaling $180,000 and including the $30,000 accompanying this settlement, the total of the above representing a payment of $360,000, constitute fair settlement for the above alleged violations and completely satisfy the Company's obligations under Final Order of Abatement No. 1931. This settlement is not a release or waiver of liability for environmental damage or resource impairment that has or may result from past, current or future Company operation.

The Company agrees, however, to pay the following liquidated damages for failure to comply with the conditions of this Final Order:

1. For those days beyond the date of entry of this Order, until May 31, 1981, any discharges from Outfalls 002, 003, 005, or 006 that are in violation of the final effluent limitations for the respective outfalls specified herein, $2,000 per day. Any pH excursions of 15 minutes or less duration shall not be subject to this $2,000 per day payment provision. All excursions, however, are subject to appropriate enforcement action.

2. On June 30, 1981 the Company shall notify the Department of Natural Resources in writing for each day since the date of entry of this Order for which the $2,000 is payable under this subsection of this Order, and the Company shall contemporaneously pay such amounts (if any) then accrued to the State.

3. A violation of the final effluent limitations for Outfalls 002, 003, 005, or 006 after the date of entry of this Order is a violation of this Final Order. The State may seek other and further relief for noncompliance conducted after any final compliance date specified in this Order.

Pennwalt Corporation is hereby put on Notice by this Commission that any material failure to comply with this Final Order may result in prompt enforcement action. A violation of any date in any of the schedules of compliance specified herein is a violation of the Total Order.

Nothing in this Order is intended to or shall deprive Pennwalt Corporation of its right or privilege to petition the Water Resources Commission or such other authority as may be appropriate for review of any matters relating to this Final Order.

This Final Order is entered on _____ by direction of the Michigan Water Resources Commission and the Director of the Department of Natural Resources and shall expire July 1, 1983. The authorizations to discharge pursuant to Section A of this Final Order shall expire upon final action by the Water Resources Commission on Pennwalt Corporation's application dated November 30, 1979 for reissuance of NPDES Permit No. MI 0002381. The Commission and the Department retain jurisdiction to modify this Order or enter such further Orders as the fact and circumstances may warrant.

PENNWALT CORPORATION

BY: _____

Dated: _____

WATER RESOURCES COMMISSION

BY: _____
Robert J. Courchaine
Executive Secretary

Dated: _____

Approved as to Substance:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Howard A. Tanner, Director

BY: _____
Office of the Director

Dated: _____

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Environmental Enforcement Division

BY: _____
Jack D. Bails, Chief

Dated: _____

Approved as to Form:

Frank J. Kelley
Attorney General

BY: _____
Assistant Attorney General

Dated: _____

ATTACHMENT A

Pennwalt Corp. Wyandotte Plant Monitoring Format for Characterization of Waste Water

From Operating Processes Discharging to 006 Outfall

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
12 (Amyl Phenols)	pH	grab	3 grabs/batch	2 events/phenol batch	Phenol Sewer @1st Manhole	11,000 g.Sump Vol measurement	Std. Methods
	pH phenol substituted phenols a)	composite	continuous batch	2 events/phenol batch	Phenol Sewer @1st Manhole	11,000 g.Sump Vol measurement	Std. Methods Std. Methods G.C./p.d.(c)
20 (Ditertiary Nonyl Polysulfides)		No process wastestream discharges: refer to washout schedule Table II.					
21 (Alkylamines)	pH	grab	3 grabs/24-hour	3 days/amine campaign	Stripper (21281)	Stripper (21281)	Std. Methods
	pH ammonia alkylamine b)	composite	continuous 24-hour	3 days/amine campaign	Stripper (21281)	Stripper (21281) measure	Std. Methods Std. Methods (Nessler) ASTM (sec and tert. amines) G.C./p.d. (individual) amines

a) Several phenol compounds are generated in this process. The specific substituted phenol to be analyzed will be determined by the phenol distillation batch being run. The following batch still charges will be monitored: regular crude batch; orthoamyl phenol batch; diamyl phenol batch.

b) Various alkylamines are produced in this process: ethyl, butyl, amyl, isopropyl, n-butyl, and sec-butyl. The specific alkyl amine to be analyzed for will be determined by the specific amine type being run.

c) G.C./p.d. Gas chromatography with photoionization detector

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
22 (Vultacs)	pH substituted phenols	grab	1 grab/batch charge 1 grab/batch aeration	5 days (Day Shift) 5 days (Day Shift)	Reactor vac jet	Reactor vac jet measure	Std. Methods G.C./p.d.
	pH	grab	1 grab/batch	5 days (Day Shift)	S-Scrubber	S-Scrubber measure	Std. Methods
	pH	grab	3 grabs/shift	5 days (Day Shift)	Acid Scrubber	Acid Scrubber measure	Std. Methods
26 (Diethyl Thioureas)	pH	grab	3 grabs/batch	3 days (Day Shift)	Reactor vac jet	Reactor vac jet measure	Std. Methods
	pH ethylamine diethyl thiourea carbon disulfide hydrogen sulfide	composite	3 grabs/batch composited	3 days (Day Shift)	Reactor vac jet	Reactor vac jet measure	Std. Methods G.C./p.d. G.C./p.d. G.C./p.d. Std. Methods
	diethyl thiourea	composite	continuous 24-hr.	3 days	Vent Scrubber	Vent Scrubber measure	G.C./p.d.
	diethyl thiourea	Measure lbs. dry product lost to floor		3 days	Packaging (flaker)	-	Weigh
26 (Ethyl Butyl Thioureas)	pH	grab	3 grabs/batch	3 days (Day Shift) (if possible)	Reactor vac jet	Reactor vac jet measure	Std. Methods
	pH ethylamine butylamine diethyl thiourea dibutyl thiourea ethyl butyl thiourea carbon disulfide hydrogen sulfide	composite	3 grabs/batch equally spaced composited	3 days (Day Shift)	Reactor vac jet	Reactor vac jet measure	Std. Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods (Sulfides)

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
28 (H_2S Recovery)							
	pH		Collect and weigh filter cake from process filter for 3 separate reaction batches Determine amount generated per day			Measure filter cake wash water	Std. Methods
	carbon disulfide						G.C./p.d.
	ethylamine						G.C./p.d.
	butylamine						G.C./p.d.
	diethyl thiourea						G.C./p.d.
	dibutyl thiourea						G.C./p.d.
	ethylbutyl thiourea						G.C./p.d.
	hydrogen sulfide						Std.Methods (Sulfides)
31(Amine)	pH	grab	1 grab every 8hr/batch	5 days*	Stripper[d] (3146)	Stripper[d] (3146)	Std. Methods
	pH	composite	continuous 24-hr.	5 days*	Stripper[d] (3146)	Stipper[d] (3146) measure	Std. Methods
	ammonia						Std. Methods
	alkylamines**						ASTM (Amine group)
	alkanolamines**						G.C./p.d. (Individual amine

* For each product run depending on production schedule. For Each product run for less than a 5 day period, monitoring will be conducted in accordance with the above during each day of production.
**The specific alkylamines or alkanolamines to be analyzed for will be determined by the product being run.

35 (Alkylamines)							
	pH	grab	3 grabs/24-hr.	5 days*	Stripper (3546)	Stripper (3546) measure	Std. Methods
	ph	composite	continuous 24-hr	5 days*	Stripper (3546)	Stripper (3546) measure	Std. Methods
	ammonia						Std. Methods
	alkylamines***						ASTM (Amine group)
							G.C./p.d. (Individual amines)

* For each product run depending on production schedule. For each product run for less than a 5 day-period, monitoring will be conducted in accordance with the above during each day of production.
***The specific alkylamines to be analyzed for will be determined by the product being run.

d) Wastestream from stripper 3146 discharged only during vacuum distillation

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
38 (Endothall Acid)	pH	grab	3 grabs/8 hr. (equally spaced)	3 events	#28 Manhole*	#28 Manhole*	Std. Methods
	pH	composite	continuous 24-hr.	3 days	#28 Manhole*	#28 Manhole*	Std. Methods
	furan						G.C./p.d.
	endothall acid						G.C./p.d.
	BOD_5						Std. Methods
38 (Dibutyl thiourea)	pH	grab	3 grabs/12 hr. (equally spaced)	3 events	#28 Manhole*	#28 Manhole*	Std. Methods
	pH	composite	continuous 24-hr.	3 days	#28 Manhole*	#28 Manhole*	Std. Methods
	dibutylthiourea						G.C./p.d.
	carbon disulfide						G.C./p.d.
	butylamine						G.C./p.d.
	hydrogen sulfide						Std. Methods (sulfides)
	*Pilot plant to be shutdown during this test and block off upstream flow into Manhole #28.						
44 (Alkanolamines)	pH	grab	1 grab every 8 hr/24-hr*	3 days	44146 Stripper	44146 Stripper measure	Std. Methods
	pH	grab	1 grab every 8 hr/24-hr*	3 days	Vac jet	Vac jet Est. calculation (design data)	Std. Methods
	pH	composite	continuous 24-hr*	3 days	44146 Stripper	44146 Stripper measure	Std. Methods
	alklamines**						G.C./p.d.
	alkanolamines**						G.C./p.d.
	ethylene oxide***						G.C./p.d.
	propylene oxide***						G.C./p.d.
	pH	composite	continuous 24-hr*	3 days	Vac jet	Vac jet Est. calculation (design data)	Std.Methods
	alkylamines**						G.C./p.d.
	alkanolamines**						G.C./p.d.
	ethylene oxide***						G.C./p.d.
	propylene oxide***						G.C./p.d.

* For each product group campaign

** The specific alkylamines and alkanolamines to be analyzed for will be determined by the product being run

*** Either ethylene oxide or propylene oxide will be analyzed depending on product being run

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
45 (Diethylhydroxyl-amine)	pH triethylamine triethylamine oxide phosphorus - total	grab	1 grab/55g wash water (3 grabs per wash cycle*) *if more than 165g. total wash water more grabs will be collected	3 events	4526 Filter washings	4526 Filter washings measure	Std.Methods G.C./p.d. G.C./p.d. Std.Methods
	pH	grab	1 grab every 8 hr/day	3 days	4531 Vac jet	4531 Vac jet measure	Std.Methods
	pH triethylamine triethylamine oxide diethylhydroxylamine	composite	continuous 24-hr.	3 days	4531 Vac jet	4531 Vac jet measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d.
	pH triethylamine triethylamine oxide diethylhydroxylamine phosphorous - total	grab	1 grab/wash cycle	3 days	4522 & 4553 Wash receivers	4522 & 4533 Wash receivers meter	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods
46 (Methane Sulfonyl Chloride and, Methane Sulfonic Acid)	pH HCl	grab	1 grab during trailer loading	3 events	4659 HCl Scrubber	4659 HCl Scrubber measure	Std.Methods Std.Methods (titration)
	pH HCl	grab	1 grab during normal venting w/o trailer loading	3 events	4659 HCl Scrubber	4659 HCl Scrubber measure	Std.Methods Std.Methods (titration)
	pH HCl	composite	continuous 24-hr	1 day	4659 HCl Scrubber	4659 HCl Scrubber measure	Std.Methods Std.Methods (titration)
	pH	grab	1 grab every 8 hr.	1 day	4632 Vac jet	4632 Vac jet measure	Std.Methods
	pH methylmercaptan chlorine methane sulfonyl chloride	composite	continuous 24-hr	3 days	4632 Vac jet	4632 Vac jet measure	Std.Methods G.C./p.d. Std.Methods G.C./p.d.

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
46 Cont'd.	pH	grab	1 grab every 8 hr	1 day	4628 Condenser (chlorine recycle)	4628 Condenser measure	Std.Methods
	pH	composite	continuous 24-hr	3 days	4628 Condenser	4628 Condenser measure	Std. Methods
	chlorine						Std.Methods
	methyl mercaptan						G.C./p.d.
	methane sulfonyl chloride						G.C./p.d.
	methane sulfonic acid						G.C./p.d.
47 (Alkanolamines)	pH	grab	1 grab every 8 hr	3 days	4765 Stripper	4765 Stripper measure	Std.Methods
	pH	composite	continuous 24-hr	3 days	4765 Stripper	4765 Stripper measure	Std.Methods
	alkylamines*						G.C./p.d.
	alkanolamines*						G.C./p.d.
	ethylene oxide** or propylene oxide**						G.C./p.d.
			*specific alkyl and alkanol amines to be analyzed are determined by amine campaign being run				
			** either ethylene oxide or propylene oxide will be analyzed depending on amine campaign being run				G.C./p.d.
	pH	grab	1 grab every 8 hr	3 days	Vac jet	Vac jet Est. calculation (design data)	Std.Methds
	pH	composite	continuous 24-hr	3 days	Vac jet	Vac jet Est.calculation (design data)	Std. Methods
	alkylamines*						G.C./p.d.
	alkanolamines*						G.C./p.d.
	ethylene oxide** or propylene oxide**						G.C./p.d.
			* specific alkyl and alkanol amines to be analyzed are determined by amine campaign being run				
			**either ethylene oxide or propylene oxide will be analyzed depending on amine campaign being run.				G.C./p.d.
Pilot Plant Batch Distillation	pH	grab	1 grab every 8 hours	3 days	4282 Vac jet	4282 Vac jet	Std. Methods
	pH	composite	continuous 24 hr.	3 days	4282 Vac jet	4282 Vac jet meter	Std.Methods
	alkylamines*						G.C./p.d.
	alkanolamines*						G.C./p.d.
	ammonia		*Specific alkyl and alkanolamines to be analyzed will be determined by product being distilled.				Std. Methods

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Pennac NB	pH	composite	continuous, 1 per batch	3 batches	4282 Vac Jet	4282 Vac Jet meter	Std.Methods
Ultra (Pilot Plant)	pH	composite	continuous, 1 per batch	3 batches	4282 Vac Jet	4282 Vac Jet meter	Std.Methods
	monoethanolamine						G.C./p.d.
	zinc						A.A. Spectra.
	N formulated 4870						Unknown
	4870						Unknown
	triethylamine						G.C./p.d.
	carbon disulfide						G.C./p.d.
	toluene						G.C./p.d.
	Pennac NB ultra						Unknown
	pH	grab	1 per filter cycle (3 per batch)	3 events	Filter (washwater)	Measure wash-water volume	Std.Methods
	pH	composite	continuous, 1 per reaction batch	3 events	Filter (wastewater)	Measure wash-water volume	Std.Methods
	monoethanolamine						G.C./p.d.
	zinc						A.A. Spectro.
	N formylated 4870						Unknown
	4870						Unknown
	triethylamine						G.C./p.d.
	carbon disulfide						G.C./p.d.
	toluene						G.C./p.d.
	Pennac NB Ultra						Unknown
Hexadecyl Disulfide	pH	composite during charging	continuous, 1 per batch	3 events	4828 Vac Jet	4282 Vac jet meter	Std.Methods
	bromine						Std.Methods
	hexadecyl-mercaptan						G.C./p.d.
	pH	composite	continuous, 1 per batch	3 events	4280 Vac jet	4280 Vac jet meter	Std.Methods
	HBr						Std.Methods
	hexadecyl mercaptan						G.C./p.d.
	hexadecyl disulfide						Unknown
	bromine						Std.Methods
	pH	composite	continuous, 1 per batch	3 events	42100 Reactor (Water layer)	42100 Reactor (Water layer) measure volume	Std.Methods
	hexadecyl disulfide						Unknown
	hexadecyl mercaptan						G.C./p.d.
	HBr						Std.Methods
	bromine						Std.Methods

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Pennac NB (Pilot Plant)	pH	grab	every 3 hrs. during stripping operation	3 events	4282 Vac jet	4282 Vac jet meter	Std. Methods
Part A	pH	composite	continuous, 1 per batch	3 events	4282 Vac jet	4282 Vac jet meter	Std.Methods
	dimethylamine						G.C./p.d.
	diethylamine						G.C./p.d.
	dibutylamine						G.C./p.d.
	carbon disulfide						G.C./p.d.
	formaldehyde						G.C./p.d.
	Pennac Part A						Unknown
	hydrogen disulfide						Std.Methods
Pennac NB	pH	grab	every 3 hrs. during stripping operation	3 events	4282 Vac jet	4282 Vac jet meter	Std. Methods
Part B (Pilot Plant)	pH	composite	continuous, 1 per batch	3 events	4282 Vac jet	4282 Vac jet meter	Std.Methods
	dimethylamine						G.C./p.d.
	dibutylamine						G.C./p.d.
	carbon disulfide						G.C./p.d.
	formaldehyde						G.C./p.d.
	thiourea						G.C./p.d.
	hydrogen disulfide						Std.Methods
	Pennac Part B						Unknown
Anhydrous Diethylhydroxylamine Distillation (Pilot Plant)	pH	grab	1 every 8 hrs/24hrs	3 days	4282 Vac jet	4282 Vac jet meter	Std.Methods
	pH	composite	continuous 24 hour	3 days	4282 Vac jet	4282 Vac jet meter	Std.Methods
	diethylhydroxyl amine						G.C./p.d.
	diethylamine						G.C./p.d.
Bdlg. 26-Drumming Vent Scrubber-124.14.2	pH	grab of spent batch	1 per batch	3 batches	Scrubber 124.14.2	Scrubber 124.14.2 measure volume	Std. Methods
	sodium methane - sulfonate						Unknown
	alkalinity						Std. Methods

Process	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Bldg. 26 Drumming Vent Scrubber - 124.14.1	pH	composite	continuous, 1 per drumming day	3 days	Scrubber 124.14.1	Scrubber 124.14.1	Std. Methods
	alkylamines					meter flow	G.C./p.d.
	orthoamyl phenol						G.C./p.d.
	pH	composite	continuous, 1 per drumming day	3 days	Scrubber 124.14.1	Scrubber 124.14.1 meter flow	Std.Methods G.C./p.d.

ATTACHMENT A Continued

Pennwalt Corp. - Wyandotte Plant - Monitoring Format for Characterization

of Waste water from Washouts of Processes Discharging to 006 Outfall

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
12 (Amy Phenol)	No discharge during washout							
20 (Di t-Nonyl Poly-sulfide)	pH t-nonyl mercaptan t-nonyl polysulfide	grab	1 per washout	1 per year	1 event	2030 Reactor	Measure volume	Std.Methods G.C./p.d. Unknown
21 (Alkylamines)	pH	grab	1 each 8 hrs. during washout	12-15 per yr.	1 event/ campaign	21101 Stripper	21101 Stripper measure	Std. Methods
	pH Ammonia Alkylamines*	composite	continuous during washout	12-15 per yr.	1 event/ campaign	21101 Stripper	21101 Stripper measure	Std. Methods Std. Methods G.C./p.d.
	pH	grab	1 each 8 hrs. during washout	12-15 per yr.	1 event/ campaign	21281 Stripper	21281 Stripper measure	Std.Methods
	pH Ammonia Alkylamines*	composite	continuous during washout	12-15 per yr.	1 event/ campaign	21281 Stripper	21281 Stripper measure	Std.Methods Std.Meth G.C./p.d.
	*The specific alkylamines to be analyzed for will be determined by the specific amine being run.							
22 (Vullacs)	No discharge during washout							
26 (Diethyl Thiourea)	pH Ethylamine Diethyl Thiourea Carbon Disulfide Hydrogen Sulfide	grab	1 per washout	1 per 2 yrs.	1 event	2603 Reactor	2603 Reactor measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
28 (H_2S Recovery)	pH	grab	5 per washout	12 per year	1 event	2812, 2813 Reactors	2812, 2813 Reactors	Std.Methods
	Carbon Disulfide	composite	2 from 2812	12 per year	1 event	2802 Day Tank	2802 Day Tank	G.C./p.d.
	Ethylamine		2 from 2813			sampled separately	metered	G.C./p.d.
	Butylamine		1 from 2802					G.C./p.d.
	Diethyl Thiourea							G.C./p.d.
	Dibutyl Thiourea							G.C./p.d.
	Ethyl-Butyl Thiourea							G.C./p.d.
	Hydrogen Sulfide							Std.Methods
31 (Amine Batch) (Distillation)	pH	grab	every 8 hrs. during cleanout	12 per year	1 event/ campaign	3146 Stripper	3146 Stripper measure	Std.Methods
	pH	composite	continuous during cleanout	12 per year	1 event/ campaign	3146 Stripper	3146 Stripper measure	Std.Methods
	Ammonia							Std.Methods
	Alkylamines*							G.C./p.d.
	Alkanolamines*							G.C./p.d.
			*The specific alkylamines and alkanolamines to be analyzed for will be determined by the product being run.					
35 (Alkylamines)	pH	composite	continuous during cleanout	8 per year	1 event/ campaign	3546 Stripper	3546 Stripper measure	Std.Methods
	Ammonia							Std.Methods
	Alkylamines*							G.C./p.d.
			*The specific alkylamines to be analyzed for will be determined by the product being run.					
38 (Endothall Acid)	pH	composite	2 grabs per washout	3 per year	1 event	3810 Crystallizer	3810 Crystallizer meter	Std.Methods
	Furan							G.C./p.d.
	Endothall Acid							G.C./p.d.
	BOD_5							Std.Methods

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
38 (Dibutyl Thiourea)	pH Dibutyl Thiourea Carbon Disulfide Butylamine Hydrogen Sulfide	composite	2 grabs per washout	3 per year	1 event	3800 Reactor	3800 Reactor meter	Std.Meth G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods
44 (Alkanolamines)	pH Alkylamines* Alkanolamines* Ethylene Oxide* Propylene Oxide*	composite	continuous during washout	18 per year	1 event/ campaign	44146 Stripper	44146 Stripper measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d.
	*The specific alkylamines, alkanolamines, ethylene oxide, or propylene oxide to be analyzed for will be determined by the product being run.							
45 (Diethylhydroxyl-amine)	pH Triethylamine Triethylamine Oxide Diethylhydroxylamine Phosphorus - total	grab	1 per washout	1 per year	1 event	4520 Reactor	4520 Reactor meter	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods
46 (Methane Sulfonyl Chloride and Methane Sulfonic (Acid)	pH Chlorine HCl Methane Sulfonic Acid	composite	continuous during washout	2 per year	1 event	4624 Acid Stripper	4624 Acid Stripper measure	Std.Meth Std.Method Std.Methods G.C./p.d.
	pH Chlorine HCl Methane Sulfonic Acid	composite	2 grabs per washout	2 per year	1 event	46115 Acid Tank	46115 Acid tank measure	Std.Methods Std.Methods Std.Methods G.C./p.d.

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
46 (Methane Sulfonyl Chloride and Methane Sulfonic Acid) (Con't.)	pH	composite	2 grabs per washout	2 per year	1 event	4633 Receiver	4633 Receiver measure	Std.Methods
	Chlorine							Std. Methods
	HCl							Std.Methods
	Methane Sulfonic Acid							G.C./p.d.
	Methane Sulfonyl Chloride							G.C./p.d.
	pH	composite	continuous during washout	4 per yr.	1 event	4698 Cooler	4698 Cooler measure	Std.Methods
	Chlorine							Std.Methods
	HCl							Std.Methods
	Methane Sulfonic Acid							G.C./p.d.
	Methane Sulfonyl Chloride							G.C./p.d.
47 (Alkanolamines)	pH	composite	continuous during washout	18 per yr.	1 event/ campaign	4765 Stripper	4765 Stripper measure	Std.Methods
	Alkylamines*							G.C./p.d.
	Alkanolamines*							G.C./p.d.
	Ethylene Oxide*							G.C./p.d.
	Propylene Oxide*							G.C./p.d.
	*The specific alkylamines, alkanolamines, and ethylene oxide or propylene oxide to be analyzed for will be determined by the product being run.							
Pilot Plant								
Batch Distillation	pH	grab	1 per washout	10 per yr.	1 event/ campaign	4260 Still	4260 Still measure	Std.Methods
	Alkylamines*							G.C./p.d.
	Alkanolamines*							G.C./p.d.

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Pilot Plant								
Batch Distillation (Cont't.)	pH	composite	continuous during washout	10 per yr.	1 event/ campaign	4270 & 4271 Receivers	4270 & 4271 Receivers measure	Std.Methods
	Alkylamines*							G.C./p.d.
	Alkanolamines*							G.C./p.d.
	*The specific Alkylamines and Alkanolamines to be analyzed for will be determined by the product being run.							
Pennac NB Ultra	pH	composite	1 grab from 4218	1 per yr.	1 event	4218 Reactor	4218, 42100,	Std.Methods
	Monoethanolamine		1 grab from 42100			42100 Reactor	42116, 42106	G.C./p.d.
	Zinc		2 grabs from 42116			42116 Receiver	42146 measure	A.A. Spectro
	N Formylated 4870		2 grabs from 42106			42106 Reactor		Unknown
	4870		2 grabs from 42146			42146 Receiver		Unknown
	Triethylamine							G.C./p.d.
	Carbon Disulfide							G.C./p.d.
	Toluene							G.C./p.d.
	Pennac NB Ultra							Unknown
	Pennac NB Ultra	grab of Liquid Layer	1 per washout	1 per year	1 event	Rotary Vac.Filter	Rotary Vac. Filter measure	Unknown
Pennac NB	pH	grab of accumulated wash waters	1 per washout	1 per 2 yrs.	1 event	42100 Reactor & 42104 Reactor	42100 Reactor 42104 Reactor measure	Std. Methods
	Dimethylamine							G.C./p.d.
	Diethylamine							G.C./p.d.
	Dibutylamine							G.C./p.d.
	Carbon Disulfide							G.C./p.d.
	Formaldehyde							G.C./p.d.
	Thiourea							G.C./p.d.
	Hydrogen Sulfide							Std.Methods
	Pennac Part A							Unknown
	Pennac Part B							Unknown

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Pilot Plant (Con't.)								
Hexadecyl Disulfide	pH	grab of accumulated wash waters	1 per washout	1 per year	1 event	42100 Reactor & 42106 Reactor	42100 Reactor &42106 Reactor measure	Std.Methods
	Bromine							Std.Methods
	HBr							Std.Methods
	Hexadecyl Mercaptan							G.C./p.d.
	Hexadecyl Disulfide							Unknown
	pH	composite	continuous during washout	1 per year	1 event	4280 Vac.Jet	4280 Vac.jet meter	Std.Methods
	Bromine							Std.Methods
Anhydrous Diethylhydroxyl-amine Distillation	pH	grab of accumulated wash waters	1 per washout	1 per year	1 event	4247 Receiver	4247 Receiver measure	Std.Methods
	Diethylhydroxyl-amine							G.C./p.d.
	Diethylamine							G.C./p.d.

NOTE: The term "1 event/campaign" is intended to indicate that one washout for each different product group will be monitored. It is not intended to indicate that each washout will be monitored.

PENNWALT
CORPORATION

4655 BIDDLE AVENUE, WYANDOTTE, MICHIGAN 48192 · (313) 285-9200

March 3, 1981

Mr. Robert J. Courchaine
Chief, Water Quality Division
Department of Natural Resources
Stevens T. Mason Building
Box 30028
Lansing, MI 48909

Dear Mr. Courchaine:

Listed below, by process, are the products which remain to be sampled as part of Pennwalt's Waste Characterization study.

Process	Product
28	Sodium Hydrosulfide
31	Hexylamines
35	Hexylamines
38	Endothall
46	Methane Sulfonyl Chloride Methane Sulfonic Acid
47	Dimethylamino-2-propanol Isopropylaminoethanols
Pilot Plant	Hexadecyldisulfide
Building 26	Sodium Methanesulfonate Alkylamines Amylphenol

The following washouts have been completed since December 30, 1980:

Process	Product
44	Dibutylaminoethanol Ethylaminoethanol

Mr. Robert J. Courchaine
Chief, Water Quality Division
Department of Natural Resources

There have been several changes in production operations since the Waste Characterization study format was written.

Diethylhydroxylamine is now produced only in Process 45; the pilot plant operation, with respect to this product, has been terminated.

Currently, Processes 44 and 47 clean out with no water being discharged to the sewer.

Sincerely,

PENNWALT CORPORATION

J. E. Rhodes
Manager, Technical Department

JER:blw

cc: Paul Zugger
David Batchelor
Roy Schrameck

Bill
Jerry

March 3, 1981

Pennwalt Corporation
3 Parkway
Philadelphia, PA 19102

Attention: Mr. Fred Veil

Re: Final Order of Abatement No. 1994

Gentlemen:

Please find a copy of an executed Final Order of Abatement No. 1994 enclosed for your records. If you have any questions regarding this matter, please feel free to contact Mr. Scott Ross at 517/373-8448.

Very truly yours,

WATER RESOURCES COMMISSION

Robert J. Courchaine
Executive Secretary

RJC:RLS:ma
cc: Files (2)
J. Bogan, Pennwalt Corp.
J. Tracht, Pennwalt Corp.
F. Baldwin
K. Zollner
T. K. Wu
A. Howard
S. Freeman
J. Bails
R. Schrameck
A. Manzardo, EPA
Data Center, DNR
S. E. Mich. Council of Governments

STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES

WATER RESOURCES COMMISSION

IN THE MATTER OF APPEARANCE OF [illegible]: Pennwalt Corp. Wyandotte, Michigan

NPDES PERMIT NO. MI 0002381
FINAL ORDER NO. 1994

[illegible]

session of the Water Resources Commission on February 19, 1981, at Lansing, Michigan, upon presentation by staff of the Water Quality Division, and based upon the official files of the Water Resources Commission:

IT IS [illegible] FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that Pennwalt Corporation was issued National Pollutant Discharge Elimination System (NPDES) Permit No. MI 0002381 on June 20, 1975, for its Wyandotte facility in Wyandotte, Michigan. Said Permit was revised March 3, 1976, and again May 21, 1976.

IT IS [illegible] THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, the Federal Clean Water Act of 1977 (P.L. 95-217), which amended the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), and the Michigan Water Resources Commission Act (Act 245, P.A. 1929 as amended), require that by no later than July 1, 1977, all dischargers to the surface waters of the State of Michigan have waste treatment facilities installed and operating, which conform with Best Practicable Control Technology Currently Available (B.P.C.T.C.A.) as defined by the United States Environmental Protection Agency (U.S. EPA) and any more stringent limitations necessary to meet the water quality standards of the State of Michigan.

IT IS [illegible] THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that NPDES Permit No. MI 0002381 contained final effluent limitations and a schedule of compliance to achieve those limitations by July 1, 1977.

IT IS [illegible] THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that although Pennwalt Corporation complied with portions of the schedule of compliance, the company violated the terms and conditions of NPDES Permit No. MI 0002381 by its continued inability to achieve effluent limitations specified within the permit.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources [illegible]ssion and Michigan Department of Natural Resources, that as a result of these continuing violations, a Final Order of Abatement, [illegible] Order No. 1931 was entered in October 1977. Under provisions [illegible] the Final Order, Pennwalt Corporation immediately paid as liquidated damages the sum of one hundred fifty thousand dollars ($150,000.00) to the general fund of the State of Michigan. Additionally, the Final Order modified the schedule of compliance contained in [illegible] Permit No. MI 0002381, allowing an extension of time for achieving compliance to October 1, 1977, for Outfall 002, to April 1, 1978, for Outfalls 003 and 005, and to February 1, 1978, for Outfall 006.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources [illegible]ssion and the Michigan Department of Natural Resources, that Pennwalt Corporation failed to attain the operational level necessary to meet the effluent limitations specified in Final Order No. 1931 in accordance with the schedule outlined therein.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources [illegible]ssion and the Michigan Department of Natural Resources, that under provisions of Final Order 1931, specific to violations of final effluent limitations after required compliance dates, Pennwalt Corporation [illegible] made payments of liquidated damages totaling an additional one hundred eighty thousand dollars ($180,000.00). Subsequent violations of the final effluent limitations were violations of the Final Order for which the State could seek other and further relief.

IT IS THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that in accordance with Part 5 Rules of the General Rules of the Water Resources Commission that Pennwalt Corporation is required to submit and implement a Pollution Incident Prevention Plan.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources [illegible]ssion and the Michigan Department of Natural Resources, that Pennwalt Corporation submitted a revised Pollution Incident Prevention Plan (PIPP) November 16, 1979 and that said plan included a proposed implementation schedule for construction of additional containment facilities for both the East and West Plants.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources [illegible]ssion and the Michigan Department of Natural Resources, that the [illegible] limitations contained in the United States Environmental Protection Agency (EPA) promulgated guidelines for the Inorganic Chemical industry subcategory, dated March 12, 1974 and May 22, 1975, are not applicable to the Pennwalt facilities.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the Company continuously measures pH at all its process wastewater discharges.

IT IS [illegible] FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the EPA [illegible] FOR MODIFICATION OF PH EFFLUENT [illegible] POLLUTANT SOURCES REQUIRED [illegible] published November [illegible] standards (6.0-9.0) whenever final effluent pH is required to be measured continuously may be beyond the capabilities of BPT and BCT systems."

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Department of Natural Resources, that, as evidenced by the Company's December 18, 1979, demonstration of their existing pH control facilities, the pH limitations contained in this Final Order are appropriate.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that compliance with the pH limitations contained in this Final Order will insure full protection of the State's water quality standards and will protect the State's waters against pollution, impairment, or destruction.

IT IS AGREED BY ALL PARTIES, the Department of Natural Resources, the Water Resources Commission, and Pennwalt Corporation, that in the absence of effective guidelines for pH, it is the judgment of the parties that the pH control facilities installed by the Company constitute Best Practicable Control Technology Currently Available (B.P.C.T.C.A.). The parties also recognize that the United States Environmental Protection Agency (EPA) has neither made a final determination on this issue nor authorized the inclusion of the pH limitations contained herein in a revised NPDES permit for Pennwalt, and that a final determination by EPA on this issue may require modification of this Final Order or the NDPES permit. In this event, either party may seek such modification.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the Company has reviewed this Consent Order and while neither admitting nor denying that litigation of the issues would have resulted in a finding of the violations referred to in this Order or award of the charges set forth in this Order, has agreed to its entry as a Final Order of the Water Resources Commission.

IT IS THEREFORE ORDERED that Final Order of Abatement No. 1931 entered on October 14, 1977 is hereby rescinded.

IT IS FURTHER ORDERED that NPDES Permit No. MI 0002381 issued on June 20, 1975, as subsequently revised, is in full force and effect except that compliance with Section A of this Final Order constitutes compliance with Part I, Section A of the NPDES permit until NPDES Permit No. MI 0002381 is reissued, suspended, rescinded or revoked.

SECTION A EFFLUENT CONDITIONS AND MONITORING REQUIREMENTS

IT IS FURTHER ORDERED that Pennwalt Corporation shall comply with the following restrictions and conditions:

1. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of eight million one hundred thousand (8,100,000) gallons per day of noncontact cooling water from Outfall 001. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations kg/day (lbs/day) Monthly Average	Daily Maximum	Other Limitations Monthly Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3x Weekly	
Total Suspended Solids					Weekly	Grab
Total Residual Chlorine					Weekly	Grab
Ammonia (as N)					Weekly	Grab
Chlorides					Weekly	Grab
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Weekly	Reading
COD					Weekly	Grab

The term noncontact cooling water shall mean water used for cooling which does not come into direct contact with any raw material, intermediate product, by product, waste product, or finished product.

a. The pH shall not be less than 6.0 nor greater than 9.0. The pH shall be monitored as follows: weekly; grab.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 001 prior to discharge to Wye Street storm sewer.

e. In the event the permittee shall require the use of Water Treatment additives the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1 of NPDES Permit No. MI 0002381.

2. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of seventeen million nine hundred thousand (17,900,000) gallons per day of contact cooling water, process water, and noncontact cooling water from Outfall 002. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Monthly Average	Daily Maximum	Other Limitations Monthly Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M³/Day (MGD)					3x Weekly	
Chlorides					3x Weekly	24 Hr. Comp.
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Daily	Reading
COD					3x Weekly	24 Hr. Comp.
Total Suspended Solids	4103(9046)	8206(18092)			5x Weekly	Grab
Ammonia (as N)			1.4 mg/l	2.3 mg/l	3x Weekly	24 Hr. Comp.
Total Residual Chlorine			1.0 mg/l	1.5 mg/l	Daily	Grab
Total Lead	0.6(1.37)	1.25(2.75			Twice Monthly	24 Hr. Comp.

The term noncontact cooling water shall mean water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product, or finished product.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 5.0 to 10.0, 95% of the time; within the range of 3.0 to 11.0, 99% of the time; within the range of 2.0 to 12.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous; report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 002 prior to discharge to the Detroit River.

e. In the event the permittee shall require the use of Water Treatment additives, the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1 of NPDES Permit No. MI 0002381.

3. Final Effluent Limitations

During the period beginning on the effective date of the Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of nine million eight hundred thousand (9,800,000) gallons per day of contact cooling water, process water, including waste water from the cell room, and noncontact cooling water from Outfall 003. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations kg/day (lbs/day) Monthly Average	Daily Maximum	Other Limitations Monthly Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M³/Day (MGD)					3x Weekly	
Chlorides					3x Weekly	24 Hr. Comp.
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Daily	Reading
Total Suspended Solids	1481(3266)	2963(6532)			5x Weekly	Grab
Ammonia (as N)			3 mg/l	5 mg/l	3x Weekly	24 Hr. Comp.
Total Copper				1.0 mg/l	Twice Monthly	24 Hr. Comp.
Total Lead	0.45(1.0)	0.9(2.0)			Twice Monthly	24 Hr. Comp.
Total Residual Chlorine			1.0 mg/l	1.5 mg/l	Daily	Grab

The term noncontact cooling water means water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product, or finished product.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 6.0 to 11.0, 99% of the time; and within the range of 2.0 to 11.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous; report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 003 prior to discharge to the Detroit River.

e. In the event the permittee shall require the use of Water Treatment additives, the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1 of NPDES Permit No. MI 0002381.

5. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of two million three hundred thousand (2,300,000) gallons per day** of process water, including ferric chloride process water from Outfall 005. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations kg/day (lbs/day)** Monthly Average	Daily Maximum	Other Limitations Monthly Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					Continuous	
Total Suspended Solids*	212(467)	425(934)	35 mg/l	70 mg/l	5x Weekly	Grab
COD		821(1801)			3x Weekly	24 Hr. Comp.
Ammonia (as N)			1.0 mg/l	1.5 mg/l	3x Weekly	24 Hr. Comp.
Total Residual Chlorine			1.0 mg/l	1.5 mg/l	Daily	Grab
Chlorides					3x Weekly	24 Hr. Comp.
Total Lead	0.6(1.4)	1.2(2.7)	0.1 mg/l	0.2 mg/l	Twice Monthly	24 Hr. Comp.
Oil & Grease			No Visible Film		Daily	Visual Observation
Temperature					Daily	Reading

* The above limitations for Total Suspended Solids may be modified to net value upon demonstration to the Chief of the Water Quality Division of the Michigan Department of Natural Resources that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4 of NPDES Permit No. 0002381.

** kg/day (lbs/day) values are not related to flow volume.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 5.0 to 10.0, 95% of the time; within the range of 3.0 to 11.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH shall be monitored as follows: continuous - report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 005 prior to mixing with effluent from the Wyandotte-Wayne waste water treatment plant.

5. Final Effluent Limitations - Total Chloride Loading

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge contact cooling water, barometric condenser water, noncontact cooling water and process water from Outfalls 001, 002, 003 and 005. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Total Combined Outfalls 001, 002, 003 and 005:			
Chlorides*	227,000(500,000)	3x Weekly	Calculat

* The above limitations for chlorides may be modified to a net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4 of NPDES Permit No. MI 0002381.

6. Final Effluent Limitations

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee is authorized to discharge up to a maximum of ten million (10,000,000) gallons per day of noncontact cooling water, barometric condenser water and process water from Outfall 006. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day(lbs/day)* Monthly Average	Daily Maximum	Other Limitations Monthly Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3x Weekly	
BOD_5	661(1457)	967(2133)			3x Weekly	24 Hr. Comp.
COD					3x Weekly	24 Hr. Comp.
Total Suspended Solids	173(380) (net)	259(570) (net)			3x Weekly	24 Hr. Comp.
Chlorides		4000(8800) (net)			3x Weekly	24 Hr. Comp.
Ammonia (unionized)				0.2 mg/l	3x Weekly	Grab
Total Residual Chlorine				0.5 mg/l	3x Weekly	Grab
Phenol		4.5(10)		0.2 mg/l	3x Weekly	24 Hr. Comp.
Sulfide					Weekly	24 Hr. Comp.
Temperature					3x Weekly	Reading
Oil & Grease			No Visible Film		Daily	Visual Observation
Total Zinc				1.0 mg/l	Twice Monthly	24 Hr. Comp.

* kg/day (lbs/day) values are not related to the flow volume.

a. The pH shall be within the range of 6.0 to 9.5, 90% of the time; within the range of 6.0 to 10.0, 100% of the time during a 24 hour period beginning on or about 7:00 a.m. of each day. The pH will be monitored as follows: continuous - report the maximum and minimum and percent of time within each range during the above 24 hour period.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at Outfall 006 prior to discharge to Monguagon Creek.

7. Intake Monitoring Requirements

During the period beginning on the effective date of this Final Order and lasting until the expiration of authorization under this Final Order, the permittee shall monitor the intake as specified below:

Characteristic	Monitoring Requirements: Measurement Frequency	Sample Type
BOD_5	Weekly	24 Hr. Comp.
Total Suspended Solids	5x Weekly	24 Hr. Comp.
Chlorides	3x Weekly	24 Hr. Comp.
COD	3x Weekly	24 Hr. Comp.

a. Samples taken in compliance with the monitoring requirements above shall be taken of the intake after initial screening.

8. Limitations, Monitoring and Reporting Requirements for Deep Disposal Well

Beginning upon the issuance of this Final Order and lasting until the expiration of authorization of this Final Order the permittee shall dispose of previously authorized wastewaters into an approved strata by means of disposal wells which shall be equipped, tested, and operated in conformance with the requirements of the Mineral Wells Act, Act 315, Public Acts of 1969 and Act 245, Public Acts of 1929, as amended, and the rules promulgated thereunder. The company shall submit to the Chief of the Water Quality Division and obtain his approval of its contingency plan for periods of outage of the deep well disposal system. Any outage of the deep well disposal system shall be immediately reported to the Chief of the Water Quality Division and the Geological Survey Division Supervisor of Waste Disposal Wells.

Monitoring Requirements for Deep Well Disposal

PARAMETER	LIMITS	FREQUENCY	TYPE
Wellhead Pressure	(None set)	Weekly	Psig
Flow Rate		Weekly	GPM (Max. Rate)
Flow Total		Monthly	MG/MIN (Last day)
Total Suspended Solids		Weekly	mg/l (Grab)

The disposal to the deep well is limited to currently authorized discharges. Any new discharges to the deep well shall be done in accordance with Part II-A-1 of NPDES Permit No. MI 0002381.

The above authorization pertains to the deep well disposal units as permitted by the Geological Survey Division of the Michigan Department of Natural Resources.

Mineral Well Permit No.	Well No.
049-736-882	4-049
048-736-882	6-048
047-736-882	15-047

Reporting Requirements for Deep Well Disposal

The permittee shall comply with the following reporting in accordance with the schedule under C of NPDES Permit No. MI 0002381, Schedule of Compliance - Deep Well Disposal.

a. Submit contingency plans for periods of outage.

b. Submit a completed Michigan Discharge Permit Application and a "Well and Reservoir Data on Underground Industrial Waste Disposal Systems" form (as approved by the Geological Survey Division of the Department of Natural Resources) for each disposal well to the Chief of the Water Quality Division Department of Natural Resources on or before N/A.

Review of the discharge(s) to the deep disposal well(s) will be made upon receipt of the application. Any modification in the disposal well requirements of the permit will be made in accordance with Part II-A-4 of NPDES Permit No. MI 0002381.

SECTION B POLLUTION INCIDENT PREVENTION PLAN

IT IS FURTHER ORDERED that Pennwalt Corporation implement the approved Pollution Incident Prevention Plan in accordance with the following schedule:

1. West Plant

a. Secondary Containment (Diked Tanks)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.
2.) Complete construction by November 1, 1981.

b. Spillage Containment (Tank Car and Tank Trailer Building No. 49 Unloading/Loading)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.
2.) Complete construction by August 1, 1981.

c. Spillage Drainage Prevention (Tank Car and Tank Trailer Loading/Unloading)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by October 1, 1981.

d. In-Process Containment Facilities (Sump and Valves)
1.) Submittal and approval of a final design, typical of the facilities to be constructed, by March 1, 1981.

2.) Complete construction by June 1, 1982.

e. Vacuum Trailer
1.) A vacuum trailer is on site and operational.

2. East Plant

a. Secondary Containment (Diked Tanks)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by August 1, 1981.

b. Secondary Spill Prevention (Dry Moats)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by November 1, 1981.

c. Alternate Containment Program (Undiked Tanks-Plugs)
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by October 1, 1981.

d. Spillage Containment (Tank Trailer Unloading)
1.) The Company has submitted and received approval of final design, typical of the facilities to be constructed.
2.) Complete construction by September 1, 1981.

e. Spillage Drainage Prevention (Tank Car and Tank Trailer).
1.) The Company has submitted and received approval of a final design, typical of the facilities to be constructed.

2.) Complete construction by August 1, 1981.

f. Alternate Containment Program (In-Process)
1.) Submittal and approval of a final design, typical of the facilities to be constructed, by June 1, 1981.

2.) Complete construction by September 1, 1982.

g. Liquid Ferric Sludge (Defluidizing Pad)
1.) Submittal and approval of a final design, typical of the facilities to be constructed, by April 1, 1981.

2.) Complete construction by September 1, 1981.

No later than 14 calendar days following any of the dates for completion of construction identified in the above schedule of compliance, the Company shall submit a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken and the projected date for completion of construction.

IT IS FURTHER ORDERED that Pennwalt Corporation submit progress reports on or before July 1, 1981, January 1, 1982, July 1, 1982, and January 1, 1983 regarding the status of implementation of the Pollution Incident Prevention Plan.

SECTION C PROCESS WASTEWATER CHARACTERIZATION STUDY

Pennwalt Corporation shall conduct a Process Wastewater Characterization Study in accordance with Attachment "A" hereto in accordance with the following:

1. Submit an approvable schedule to implement the Wastewater Characterization Study, Attachment "A" to the Chief of the Water Quality Division on or before July 31, 1980. The Company has submitted a schedule which is under review.

2. Submit a listing of parameters by process, for which analytical procedures are currently not available, to the Chief of the Water Quality Division on or before July 31, 1980. The Company has submitted this listing.

3. Submit an approvable detailed analytical procedure for each parameter identified in 2. above to the Chief of the Water Quality Division by date of entry of this Final Order, except as provided in 4. below. The analytical procedures approved by the Chief of the Water Quality Division shall be utilized in the process wastewater characterization study. The Company has submitted a proposed analytical procedure for the C1 - C7 alkylamines through di-n-butylamine which is under review.

4. Where analytical procedures cannot be developed for any parameter(s) the Company shall submit detailed documentation of attempts to develop such procedure(s) and a proposal for additional research to accomplish same, including an implementation schedule, to the Chief of the Water Quality Division on or before February 28, 1981. Any additional research to develop analytical procedures must receive the approval of the Chief of the Water Quality Division. Termination of attempts to develop analytical procedures must receive the approval of the Chief of the Water Quality Division.

5. Submit a progress report to the Chief of the Water Quality Division detailing the actions the Company has taken to comply with this section. Said report shall be submitted by no later than February 28, 1981.

6. Submit the results of the Process Wastewater Characterization Study to the Chief of the Water Quality Division on or before April 30, 1981.

SECTION D CONCLUSION

IT IS AGREED that the entry of this Final Order is in settlement for violations of NPDES Permit No. MI 0002381 and Final Order of Abatement F.O. 1931. The entry of this Final Order completes the Company's obligations under the Final Order No. 1931 and supercedes and rescinds Final Order No. 1931.

The Pennwalt Corporation agrees that but for this Final Order, the Company might be subject to the civil monetary provisions provided by law for failure of the Company to be in full compliance with the terms and conditions of NPDES Permit No. MI 0002381 and Final Order of Abatement No. 1931. The Pennwalt Corporation and the Department hereby agree that the $150,000 liquidated damages paid on October 10, 1977, and the liquidated damages payments paid pursuant to Final Order No. 1931 totaling $[illegible] and including the $30,000 accompanying this settlement, the total of the above representing a payment of $960,000, constitute fair settlement for the above alleged violations and completely satisfy the Company's obligations under Final Order of Abatement No. 1931. This settlement is not a release or waiver of liability for environmental damage or resource impairment that has or may result from past, current or future Company operation.

The Company agrees, however, to pay the following liquidated damages for failure to comply with the conditions of this Final Order:

1. For those days beyond the date of entry of this Order, until May 31, 1981, any discharges from Outfalls 002, 003, 005, or 006 that are in violation of the final effluent limitations for the respective outfalls specified herein, $2,000 per day. Any pH excursions of 15 minutes or less duration shall not be subject to this $2,000 per day payment provision. All excursions, however, are subject to appropriate enforcement action.

2. On June 30, 1981 the Company shall notify the Department of Natural Resources in writing for each day since the date of entry of this Order for which the $2,000 is payable under this subsection of this Order, and the Company shall contemporaneously pay such amounts (if any) then accrued to the State.

3. A violation of the final effluent limitations for Outfalls 002, 003, 005, or 006 after the date of entry of this Order is a violation of this Final Order. The State may seek other and further relief for noncompliance conducted after any final compliance date specified in this Order.

Pennwalt Corporation is hereby put on Notice by this Commission that any material failure to comply with this Final Order may result in prompt enforcement action. A violation of any date in any of the schedules of compliance specified herein is a violation of the Total Order.

Nothing in this Order is intended to or shall deprive Pennwalt Corporation of any right or privilege to petition the Water Resources Commission or such other authority as may be appropriate for review of any matters relating to this Final Order.

This Final Order is entered on February 12, 1981 by direction of the Michigan Water Resources Commission of the Department of Natural Resources and shall expire July 1, 1983. The authorizations to discharge pursuant to Section A of this Final Order shall expire upon final action by the Water Resources Commission on Pennwalt Corporation's application dated November 30, 1979 for reissuance of NPDES Permit No. MI 0002381. The Commission and the Department retain jurisdiction to modify this Order or enter such further Orders as the fact and circumstances may warrant.

PENNWALT CORPORATION

BY: Robert S Custer

Robert S. Custer
Vice President - Chemicals

Dated: 2-11-81

WATER RESOURCES COMMISSION

BY: Robert J. Courchaine

Robert J. Courchaine
Executive Secretary

Dated: 2-24-81

Approved as to Substance:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Howard A. Tanner, Director

BY: Howard A. Tanner
Office of the Director

Dated: February 26, 1981

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Environmental Enforcement Division

BY: Jack D. Bates, Chief

Dated: 2-24-81

Approved as to Form:

Frank J. Kelley
Attorney General

BY: [signature]
Assistant Attorney General

Dated: February 26, 1981

ess	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
							Std. Methods
							G.C./p.d.
							G.C./p.d.
							G.C./p.d.
							G.C./p.d.
							G.C./p.d.
							G.C./p.d.
							Std.Methods (Sulfides)
(Amine)	pH	grab	1 grab every 8hr/batch	5 days*	Stripper[d] (3146)	Stripper[d] (3146)	Std. Methods
	pH	composite	continuous 24-hr.	5 days*	Stripper[d] (3146)	Stripper[d] (3146) measure	Std. Methods
	ammonia						Std. Methods
	alkylamines**						ASTM (Amine group)
	alkanolamines**						G.C./p.d. (Individual amines)

* For each product run depending on production schedule. For Each product run for less than a 5 day period, monitoring will be conducted in accordance with the above during each day of production.
**The specific alkylamines or alkanolamines to be analyzed for will be determined by the product being run.

(Alkylamines)							
	pH	grab	3 grabs/24-hr.	5 days*	Stripper (3546)	Stripper (3546) measure	Std. Methods
	pH	composite	continuous 24-hr	5 days*	Stripper (3546)	Stripper (3546) measure	Std. Methods
	ammonia						Std. Methods
	alkylamines***						ASTM (Amine group)
							G.C./p.d. (Individual amines)

* For each product run depending on production schedule. For each product run for less than a 5 day-period, monitoring will be conducted in accordance with the above during each day of production.
***The specific alkylamines to be analyzed for will be determined by the product being run.

d) Wastestream from stripper 3146 discharged only during vacuum distillation

ess	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Endothall Acid)	pH	grab	3 grabs/8 hr. (equally spaced)	3 events	#28 Manhole*	#28 Manhole*	Std. Methods
	pH	composite	continuous 24-hr.	3 days	#28 Manhole*	#28 Manhole*	Std. Methods
	furan endothall acid						G.C./p.d.
							G.C./p.d.
	BOD_5						Std. Methods
(Dibutyl thiourea)	pH	grab	3 grabs/12 hr. (equally spaced)	3 events	#28 Manhole*	#28 Manhole*	Std. Methods
	pH	composite	continuous 24-hr.	3 days	#28 Manhole*	#28 Manhole*	Std. Methods
	dibutylthiourea						G.C./p.d.
	carbon disulfide						G.C./p.d.
	butylamine						G.C./p.d.
	hydrogen sulfide						Std. Methods (sulfides)

*Pilot plant to be shutdown during this test and block off upstream flow into Manhole #28.

(Alkanolamines)							
	pH	grab	1 grab every 8 hr/24-hr*	3 days	44146 Stripper	44146 Stripper measure	Std. Methods
	pH	grab	1 grab every 8 hr/24-hr*	3 days	Vac Jet	Vac Jet Est. calculation (design data)	Std. Methods
	pH	composite	continuous 24-hr*	3 days	44146 Stripper	44146 Stripper measure	Std. Methods
	alkylamines**						G.C./p.d.
	alkanolamines**						G.C./p.d.
	ethylene oxide***						G.C./p.d.
	propylene oxide***						G.C./p.d.
	pH	composite	continuous 24-hr*	3 days	Vac Jet	Vac Jet Est. calculation (design data)	Std.Methods
	alkylamines**						G.C./p.d.
	alkanolamines**						G.C./p.d.
	ethylene oxide***						G.C./p.d.
	propylene oxide***						G.C./p.d.

* [illegible] product [illegible] campaign
** [illegible] alkylamines and alkanolamines to be analyzed for will be determined by the product being run
*** [illegible] ethylene oxide or propylene oxide will be analyzed depending on product being run

s	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
...thyl, Diisopyl-...ine)	... triethylamine triethylamine oxide phosphorus - total	grab	1 sample/wash water (3 events per wash cycle*) *if more than 165g. total wash water more grabs will be collected	3 events	... filter washings	... washings measure	Std.Methods G.C./p.d G.C./p.d Std.Methods
	pH	grab	1 grab every 8 hr/day	3 days	4531 Vac jet	4531 Vac jet measure	Std.Methods
	pH triethylamine triethylamine oxide diethylhydroxylamine	composite	continuous 24-hr.	3 days	4531 Vac jet	4531 Vac jet measure	Std.Methods G.C./p.d G.C./p.d G.C./p.d
	pH triethylamine triethylamine oxide diethylhydroxylamine phosphorous - total	grab	1 grab/wash cycle	3 days	4522 & 4553 Wash receivers	4522 & 4533 Wash receivers meter	Std.Methods G.C./p.d G.C./p.d G.C./p.d Std.Methods
...ethane Sulfonyl Chloride and, Methane Sulfonic Acid)	pH HCl	grab	1 grab during trailer loading	3 events	4659 HCl Scrubber	4659 HCl Scrubber measure	Std.Methods Std.Methods (titration)
	pH HCl	grab	1 grab during normal venting w/o trailer loading	3 events	4659 HCl Scrubber	4659 HCl Scrubber measure	Std.Methods Std.Methods (titration)
	pH HCl	composite	continuous 24-hr	1 day	4659 HCl Scrubber	4659 HCl Scrubber measure	Std.Methods Std.Methods (titration)
	pH	grab	1 grab every 8 hr.	1 day	4632 Vac jet	4632 Vac jet measure	Std.Methods
	pH methylmercaptan chlorine metnane sulfonyl chloride	composite	continuous 24-hr	3 days	4632 Vac jet	4632 Vac jet measure	Std.Methods G.C./p.d Std.Methods G.C./p.d

...ess	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
...ont'd.	pH	grab	1 grab every 8 hr	1 day	4628 Condenser (chlorine recycle)	4628 Condenser measure	Std.Methods
	pH chlorine methyl mercaptan methane sulfonyl chloride methane sulfonic acid	composite	continuous 24-hr	3 days	4628 Condenser	4628 Condenser measure	Std. Methods Std.Methods G.C./p.d. G.C./p.d. G.C./p.d.
(Alkanolamines)	pH	grab	1 grab every 8 hr	3 days	4765 Stripper	4765 Stripper measure	Std.Methods
	pH alkylamines* alkanolamines* ethylene oxide** or propylene oxide**	composite	continuous 24-hr *specific alkyl and alkanol amines to be analyzed are determined by amine campaign being run ** either ethylene oxide or propylene oxide will be analyzed depending on amine campaign being run	3 days	4765 Stripper	4765 Stripper measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d.
	pH	grab	1 grab every 8 hr	3 days	Vac jet	Vac jet Est. calculation (design data)	Std.Methods
	pH alkylamines* alkanolamines* ethylene oxide** or propylene oxide**	composite	continuous 24-hr * specific alkyl and alkanol amines to be analyzed are determined by amine campaign being run **either ethylene oxide or propylene oxide will be analyzed depending on amine campaign being run.	3 days	Vac jet	Vac jet Est.calculation (design data)	Std. Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d
...t Plant ...ch ...illation	pH	grab	1 grab every 8 hours	3 days	4282 Vac Jet	4282 Vac jet	Std. Methods
	pH	composite	continuous 24 hr.	3 days	4282 Vac jet	4282 Vac jet meter	Std.Methods
	alkylamines* alkanolamines* ...		*specific alkyl and alkanol amines to be analyz... will be determined by ... campaign being run.				G.C./p.d G.C./p.d Std. Methods

		[illegible]	[illegible]	3 batches	42 [illegible] Vac Jet	42[illegible]	[illegible]
		[illegible]	[illegible]	3 batches	[illegible]	[illegible]	[illegible]
Pilot Plant)	[illegible] zine % formulated 4870 4870 triethylamine carbon disulfide toluene Pennac NB ultra						[illegible] [illegible] Spectro. Unknown Unknown G.C./p. . G.C./p. . G.C./p. . Unknown
	pH	grab	1 per filter cycle (3 per batch)	3 events	Filter (washwater)	Measure wash-water volume	Std.Methods
	pH monoethanolamine zinc % formulated 4870 4870 triethylamine carbon disulfide toluene Pennac NB Ultra	composite	continuous, 1 per reaction batch	3 events	Filter (wastewater)	Measure wash-water volume	Std.Methods G.C./p. . A.A. Spectro. Unknown Unknown G.C./p. . G.C./p. . G.C./p. . Unknown
decyl lfide	pH bromine hexadecyl-mercaptan	composite during charging	continuous, 1 per batch	3 events	4828 Vac Jet	4282 Vac jet meter	Std.Methods Std.Methods G.C./p. ..
	pH HBr hexadecyl mercaptan hexadecyl disulfide bromine	composite	continuous, 1 per batch	3 events	4280 Vac jet	4280 Vac jet meter	Std.Methods Std.Methods G.C./p. . Unknown Std.Methods
	pH hexadecyl disulfide hexadecyl mercaptan HBr bromine	composite	continuous, 1 per batch	3 events	42100 Reactor (Water layer)	42100 Reactor (Water layer) measure volume	Std.Methods Unknown G.C./p. . Std.Methods Std.Methods

ss	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
: N3 ot Plant)	pH	grab	every 3 hrs. during stripping operation	3 events	4282 Vac jet	4282 Vac jet meter	Std. Methods
	pH dimethylamine diethylamine dibutylamine carbon disulfide formaldehyde Pennac Part A hydrogen disulfide	composite	continuous, 1 per batch	3 events	4282 Vac jet	4282 Vac jet meter	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. Unknown Std.Methods
: NB	pH	grab	every 3 hrs. during stripping operation	3 events	4282 Vac jet	4282 Vac jet meter	Std. Methods
3 ilot Plant)	pH diethylamine dibutylamine carbon disulfide formaldehyde thiourea hydrogen disulfide Pennac Part B	composite	continuous, 1 per batch	3 events	4282 Vac jet	4282 Vac jet meter	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods Unknown
ous Hydroxylamine ition ot Plant)	pH	grab	1 every 8 hrs/24hrs	3 days	4282 Vac jet	4282 Vac jet meter	Std.Methods
	pH diethylhydroxyl amine diethylamine	composite	continuous 24 hour	3 days	4282 Vac jet	4282 Vac jet meter	Std.Methods G.C./p.d. G.C./p.d.
[illegible]	pH [illegible]	grab of spent batch	1 per batch	3 batches	Scrubber 124.14.2	Scrubber 124.14.2 measure volume	Std. Methods Unknown

ess	Variable	Sample Type	Monitoring Frequency	Duration	Sampling Location	Flow Est. Location	Methods
[illegible] 124.14.1	[illegible] Alkylamines orthoamyl phenol pH	[illegible] composite	[illegible] continuous, 1 per drumming day	[illegible] 3 days	[illegible] Scrubber 124.14.1	[illegible] Scrubber 124.14.1 meter flow	[illegible] G.C./p.d. G.C./p.d. Std.Methods G.C./p.d.

ATTACHMENT A Continued

Pennwalt Corp. - Wyandotte Plant - Monitoring Format for Characterization

of Waste water from Washouts of Processes Discharging to 006 Outfall

ess	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
hy Phenol)	No discharge during washout							
Di t-Nonyl Poly-sulfide)	pH t-nonyl mercaptan t-nonyl polysulfide	grab	1 per washout	1 per year	1 event	2030 Reactor	Measure volume	Std.Methods G.C./p.d. Unknown
(Alkylamines)	pH	grab	1 each 8 hrs. during washout	12-15 per yr.	1 event/ campaign	21101 Stripper	21101 Stripper measure	Std. Methods
	pH Ammonia Alkylamines*	composite	continuous during washout	12-15 per yr.	1 event/ campaign	21101 Stripper	21101 Stripper measure	Std. Methods Std. Methods G.C./p.d.
	pH	grab	1 each 8 hrs. during washout	12-15 per yr.	1 event/ campaign	21281 Stripper	21281 Stripper measure	Std.Methods
	pH Ammonia Alkylamines*	composite	continuous during washout	12-15 per yr.	1 event/ campaign	21281 Stripper	21281 Stripper measure	Std.Methods Std.Methods G.C./p.d.
	*The specific alkylamines to be analyzed for will be determined by the specific amine being run.							
(Vullacs)	No discharge during washout							
(Diethyl Thioures)	pH Ethylamine Diethyl Thiourea Carbon Disulfide Hydrogen Sulfide	grab	1 per washout	1 per 2 yrs.	1 event	2603 Reactor	2603 Reactor measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods

[illegible]	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1 event	2612, 2613	2612, 2613	[illegible]
	Carbon Disulfide Butylamine Butylamine Dibutyl Thiourea Dibutyl Thiourea Ethyl Butyl Thiourea Hydrogen Sulfide	composite	3 from 2612 2 from 2613 1 from 2602	12 per year	1 event	2602 Day Tank sampled appropriately	2602 Day Tank metered	G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods
(Amine Batch) (Distillation)	pH	grab	every 8 hrs. during cleanout	12 per year	1 event/ campaign	3146 Stripper	3146 Stripper measure	Std.Methods
	pH Ammonia Alkylamines* Alkanolamines*	composite	continuous during cleanout	12 per year	1 event/ campaign	3146 Stripper	3146 Stripper measure	Std.Methods Std.Methods G.C./p.d. G.C./p.d.
			*The specific alkylamines and alkanolamines to be analyzed for will be determined by the product being run.					
(Alkylamines)	pH Ammonia Alkylamines*	composite	continuous during cleanout	8 per year	1 event/ campaign	3546 Stripper	3546 Stripper measure	Std.Methods Std.Methods G.C./p.d.
			*The specific alkylamines to be analyzed for will be determined by the product being run.					
(Endothall Acid)	pH Furan Endothall Acid BOD_5	composite	2 grabs per washout	3 per year	1 event	3810 Crystallizer	3810 Crystallizer meter	Std.Methods G.C./p.d. G.C./p.d. Std.Methods

cess	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
(Dibutyl Thiourea)	pH Dibutyl Thiourea Carbon Disulfide Butylamine Hydrogen Sulfide	composite	2 grabs per washout	3 per year	1 event	3800 Reactor	3800 Reactor meter	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods
(Alkanolamines)	pH Alkylamines* Alkanolamines* Ethylene Oxide* Propylene Oxide*	composite	continuous during washout	18 per year	1 event/ campaign	44146 Stripper	44146 Stripper measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d.
			*The specific alkylamines, alkanolamines, ethylene oxide, or propylene oxide to be analyzed for will be determined by the product being run.					
(Diethylhydroxylamine)	pH Triethylamine Triethylamine Oxide Diethylhydroxylamine Phosphorus - total	grab	1 per washout	1 per year	1 event	4520 Reactor	4520 Reactor meter	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods
(Methane Sulfonyl Chloride and Methane Sulfonic (Acid)	pH Chlorine HCl Methane Sulfonic Acid	composite	continuous during washout	2 per year	1 event	4624 Acid Stripper	4624 Acid Stripper measure	Std.Methods Std.Methods Std.Methods G.C./p.d.
	pH Chlorine HCl Methane Sulfonic Acid	composite	2 grabs per washout	2 per year	1 event	46115 Acid Tank	46115 Acid tank measure	Std.Methods Std.Methods Std.Methods G.C./p.d.

[illegible] Methane Sulfonic Acid) (Cont'd.)	pH Chlorine HCl Methane Sulfonic Acid Methane Sulfonyl Chloride	composite	2 [illegible] per washout	2 per year	1 event	[illegible]	[illegible]	[illegible] Std.Methods G.C./p.d. G.C./p.d.
	pH Chlorine HCl Methane Sulfonic Acid Methane Sulfonyl Chloride	composite	continuous during washout	4 per yr.	1 event	4698 Cooler	4698 Cooler measure	Std.Methods Std.Methods Std.Methods G.C./p.d. G.C./p.d.
:7 (Alkanolamines)	pH Alkylamines* Alkanolamines* Ethylene Oxide* Propylene Oxide*	composite	continuous during washout	18 per yr.	1 event/ campaign	4765 Stripper	4765 Stripper measure	Std.Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d.

*The specific alkylamines, alkanolamines, and ethylene oxide or propylene oxide to be analyzed for will be determined by the product being run.

Pilot Plant

Batch Distillation	pH Alkylamines* Alkanolamines*	grab	1 per washout	10 per yr.	1 event/ campaign	4260 Still	4260 Still measure	Std.Methods G.C./p.d. G.C./p.d.

ess	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
t Plant								
tch Distillation (Cont't.)	pH Alkylamines* Alkanolamines*	composite	continuous during washout	10 per yr.	1 event/ campaign	4270 & 4271 Receivers	4270 & 4271 Receivers measure	Std.Methods G.C./p.d. G.C./p.d.
	*The specific Alkylamines and Alkanolamines to be analyzed for will be determined by the product being run.							
ennac NB Ultra	pH Monoethanolamine Zinc N Formylated 4870 4870 Triethylamine Carbon Disulfide Toluene Pennac NB Ultra	composite	1 grab from 4218 1 grab from 42100 2 grabs from 42116 2 grabs from 42106 2 grabs from 42146	1 per yr.	1 event	4218 Reactor 42100 Reactor 42116 Receiver 42106 Reactor 42146 Receiver	4218, 42100, 42116, 42106 42146 measure	Std.Methods G.C./p.d. A.A. Spectro Unknown Unknown G.C./p.d. G.C./p.d. G.C./p.d. Unknown
	Pennac NB Ultra	grab of Liquid Layer	1 per washout	1 per year	1 event	Rotary Vac.Filter	Rotary Vac. Filter measure	Unknown
nac NB	pH Dimethylamine Diethylamine Dibutylamine Carbon Disulfide Formaldehyde Thiourea Hydrogen Sulfide Pennac Part A Pennac Part B	grab of accumulated wash waters	1 per washout	1 per 2 yrs.	1 event	42100 Reactor & 42104 Reactor	42100 Reactor 42104 Reactor measure	Std. Methods G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. G.C./p.d. Std.Methods Unknown Unknown

Process	Variable	Sample Type	Monitoring Frequency	Washout Frequency	Duration	Sampling Location	Flow Est. Location	Methods
Pilot Plant (Con't.)								
Hexadecyl Disulfide	pH	grab of accumulated wash waters	1 per washout	1 per year	1 event	42100 Reactor & 42106 Reactor	42100 Reactor &42106 Reactor measure	Std.Method
	Bromine							Std.Method
	HBr							Std.Method
	Hexadecyl Mercaptan							G.C./p.d.
	Hexadecyl Disulfide							Unknown
	pH	composite	continuous during washout	1 per year	1 event	4280 Vac.Jet	4280 Vac.Jet meter	Std.Methods
	Bromine							Std.Methods
Anhydrous Diethylhydroxyl-amine Distillation	pH	grab of accumulated wash waters	1 per washout	1 per year	1 event	4247 Receiver	4247 Receiver measure	Std.Method
	Diethylhydroxyl-amine							G.C./p.d.
	Diethylamine							G.C./p.d.

NOTE: The term "1 event/campaign" is intended to indicate that one washout for each different product group will be monitored. It is not intended to indicate that each washout will be monitored.

PENNWALT CORPORATION

4655 BIDDLE AVENUE, WYANDOTTE, MICHIGAN 48192 · (313) 285-9200

ATTACHMENT NO 7
1 OF 15

February 18, 1981

Mr. Robert J. Courchaine
Chief, Water Division
Department of Natural Resources
Stevens T. Mason Building
Box 30028
Lansing, MI 48909

Dear Mr. Courchaine:

As part of the requirements of Section C, Process Waste Characterization Study, of Pennwalt's Final Order of Abatement, a detailed procedure used for the characterization of Process 45 - Triethylamine oxide/Diethylhydroxylamine, is attached.

A liquid chromatographic method for the analysis of hexadecyl mercaptan and the corresponding disulfide is nearly complete, with the exception of a few minor details.

Since this product is made very infrequently, we are confident that we will have a fully completed method available by the end of the second quarter for the next projected production run.

Attempts at development of a method for Methane Sulfonyl Chloride and Methane Sulfonic Acid have not been nearly as successful. To date, we have been unable to obtain consistent results using the same technology that has been so successful for amines and their derivatives.

These two compounds are so highly polar and acidic that the gas chromatography-purge and trap system utilized for much of the work during the study has so far been unsuccessful.

Liquid chromatography is also complicated by the fact that neither the Methane Sulfonic Acid or the Methane Sulfonyl Chloride is ultra violet active; the use of refractive index detection is both insensitive at the desired levels and unreliable.

We are currently experimenting with the liquid chromatography of aromatic amine derivatives of Methane Sulfonic Acid and Methane Sulfonyl Chloride, using ion exchange separation techniques, combined with an ultraviolet detector. The results, so far, have been encouraging. We will keep you advised of our progress.

Sincerely,

PENNWALT CORPORATION

D. E. Rhodes
Manager, Technical Department

cc: Paul Zugger
David Batchelor
Roy Schrameck

GC PROCEDURE FOR DIETHYLHYDROXYLAMINE IN WATER

SCOPE:

To analyze waste water for DEHA and/or its decomposition products to the 1ppm level.

APPARATUS:

A CDS (Chemical Data Systems) model 310 trapping concentrator (fitted with their desorber and standard traps) with necessary hardware to mate to the GC used.

GC

Perkin Elmer Sigma I system fitted for on column injection using a 1/4" glass column with split disector flow to FID and NPD. Carrier gas used - Helium at 75 psig.

GC COLUMN

Glass 6 feet x 2mm ID
Chromosorb 102 with 7% Triton x 305 and 0.5% KOH (80-100 Mesh)

Syringe: Hamilton CR 700-200

PROCEDURE:

The CDS 310 is mated to the Sigma I by a 2" x 1/8" to 1/16" ss connector. It replaces the GC septum retaining nut, and is connected to the CDS 310 valve assembly discharge with a 1/8" Swagelok tube fitting. Follow the CDS manual for set up of necessary piping of carrier gas and air supply. The CDS system will control the carrier gas.

Set up the GC with the 6 ft. glass column specified above so the column will extend all the way through the GC injection port and seat against a septum inside the CDS connecting adaptor. The CDS parameters are as follows:

Carrier gas 30ml/min. at 75 psig

Desorber flow 40ml/min.

Desorber Temperature - 200°C - Heat 5 minutes - Cool 8 minutes

*Valve Temperature 200°C (approximately)

*CAUTION (refer to the manual on valve operating procedures)

Trap temperature - 200°C - 8 minutes

PROCEDURE (continued)

The Sigma I system procedure is Method #2 (see Attachment #1) and is used with a dual detection arrangement using a detector splitter 50/50 to the FID and NPD.

The column and trap system must be conditioned with repeated injections of the cleanest water obtainable. Use 2ul of water direct through the CDS "column injection port" until a reproducible scan is obtained. (See Attachment #2).

To condition the traps and desorber chamber, inject 10ul of water directly into the desorber chamber and heat for 5 minutes onto trap and cool 8 minutes. (The more water injected the longer the heat and cool cycle will have to be). The trap is then heated for about 6 to 8 minutes at 200°C backflushing onto the column.

Repeat runs until a consistent scan similar to Attachment #3 is obtained. A new column may take two or three days to condition.

Once a good blank run has been obtained, a sample run is first made using 2ul of sample injected directly to the column. Attachment #4 shows a typical scan of a test solution of 52ppm of a fresh DEHA mix through the CDS trap system. As the sample ages it will change to a combination of the peaks at 6.48, 7.90 and 8.37. If the DEHA is about 20-25ppm or less, it will decompose almost completely with the peak at 6.48 being the only one of measurable amounts. If nothing is detected, or very low response using 2ul, then inject up to 10 to 20ul into the desorber and trap system to concentrate and backflush to column.

The method must be calibrated with fresh standards.

BEF:blw
2/17/81

TO THE 1 PPM LEVEL IN ' 'STE WATER.

Attachment #1

COL-- GLASS 6FT 2MM ID CHROMOSORB 102 (80-100 mesh)
7% TRITON 305 + 0.5%KOH

L2
LST2

ATTACHMENT NO 7
5 OF 15

METHOD 2

ANALYZER CONTROL

INJ TEMP 200
DET ZONE 1,2 250 25
AUX TEMP 25
FLOW A,B 30 5
INIT OVEN TEMP,TIME 75 0

TEMP	RATE	TIME
225	12.0	8

DATA PROC

STD WT,SMP WT 1.0000 1.0000 1
FACTOR,SCALE 1 0
TIMES 20.40 0.00 11.10 14.50 327.67 327.67
SENS-DET RANGE 200 20 0.00 2 0 0
UNK,AIR 1.000 0.00
TOL 0.0000 0.050 1.0
REF PK 0.000 0.00 0.00 0.00
STD NAME

EVENT CONTROL

ATTN-CHART-DELAY 3 10 0.01

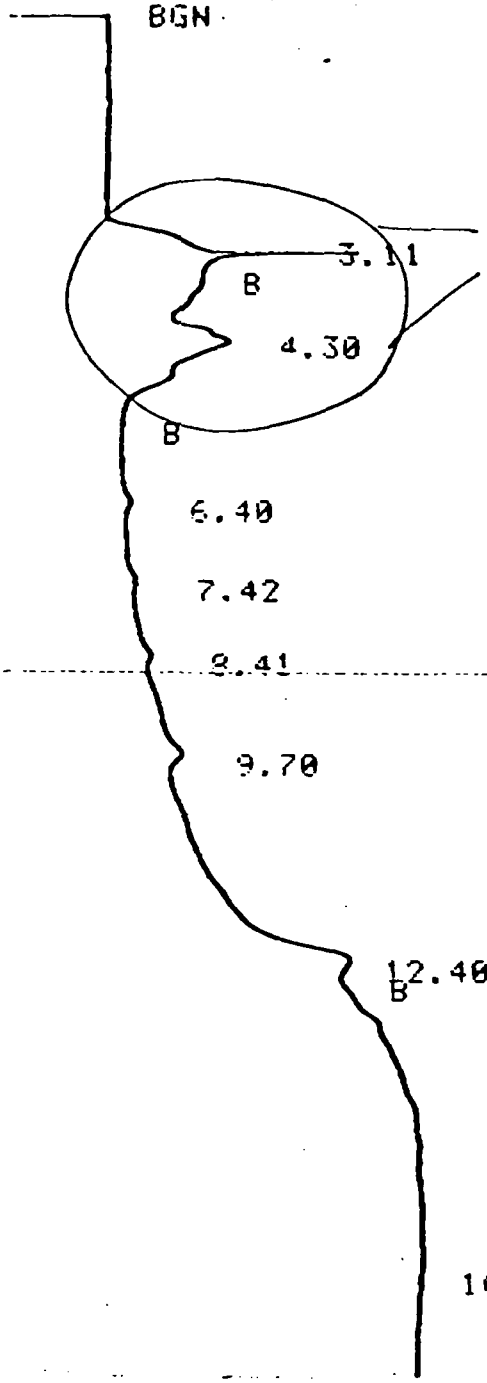
ANAL 1 DET 1 MET 2 2 FILE 47

ATTACHMENT 7
6 OF 15

RUN 7 2MM ID GLASS 6FT C102-242-7-0,5KOH

SENSITIVITIES 200 20

2µl Blank — Direct injection
NPD - Bead 410 Range 1 Att 4
Hydrogen 9 psig
FID - Air 30 psig
Hydrogen 26 psig



this is associated with water

Attachment # 3

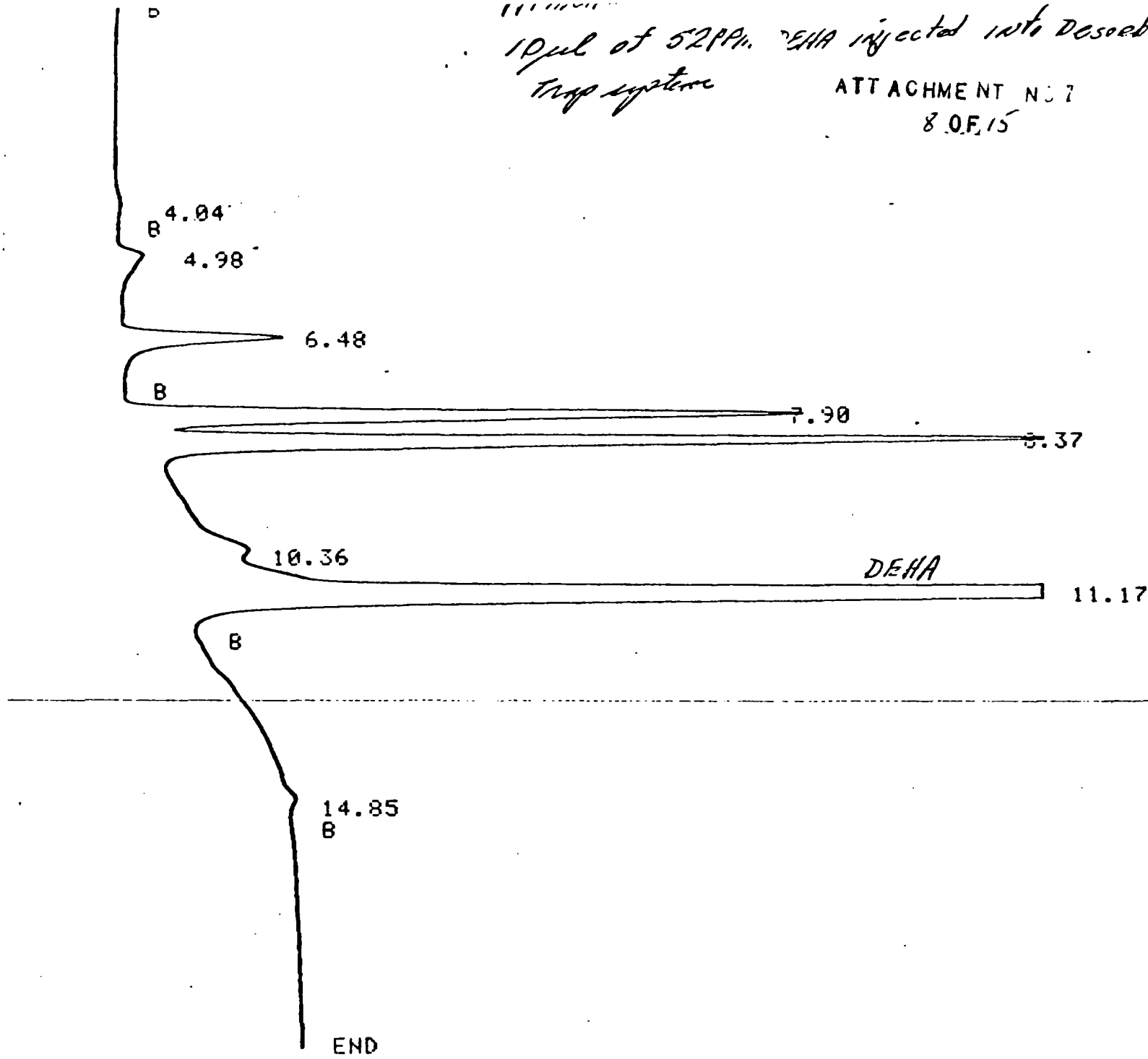
Desorber: Heat 7 mins @ 2
Cool 28 mins

TRAP: Heat 6 mins @

ATTACHMENT NO 7
7 OF 15

1 µl of 52 PPm DEHA injected into Desorb trap system

ATTACHMENT NO. 7
8 OF 15



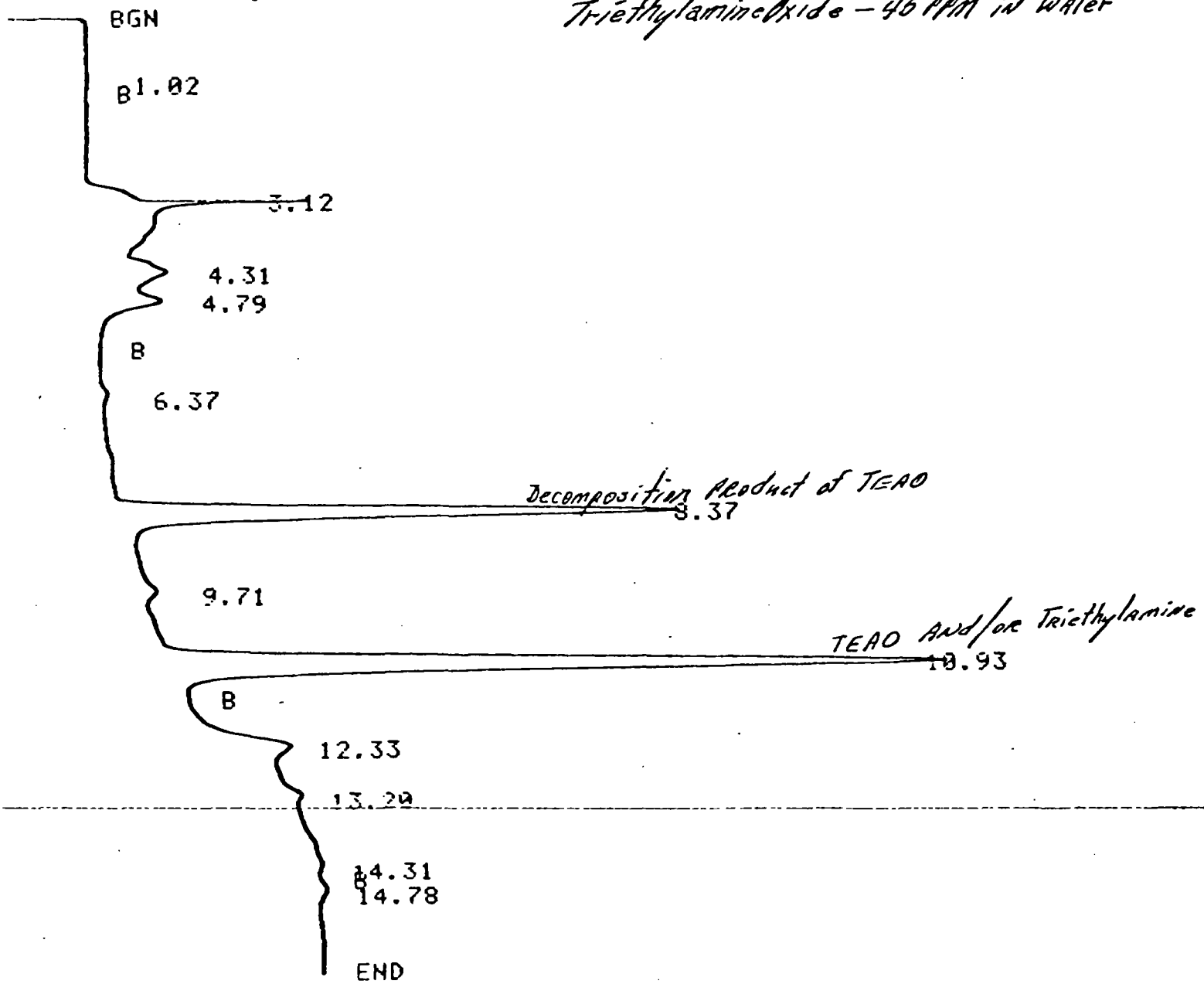
ATTACHMENT NO 7

ANAL 1 DET 1 METH 2 2 FILE 47 9 06 15

PUN 2 GLASS 6FT 2MMID DEHA COLUMN

SENSITIVITIES 200 20

2µl (Direct injection)
Triethylamineoxide – 46 PPM in Water



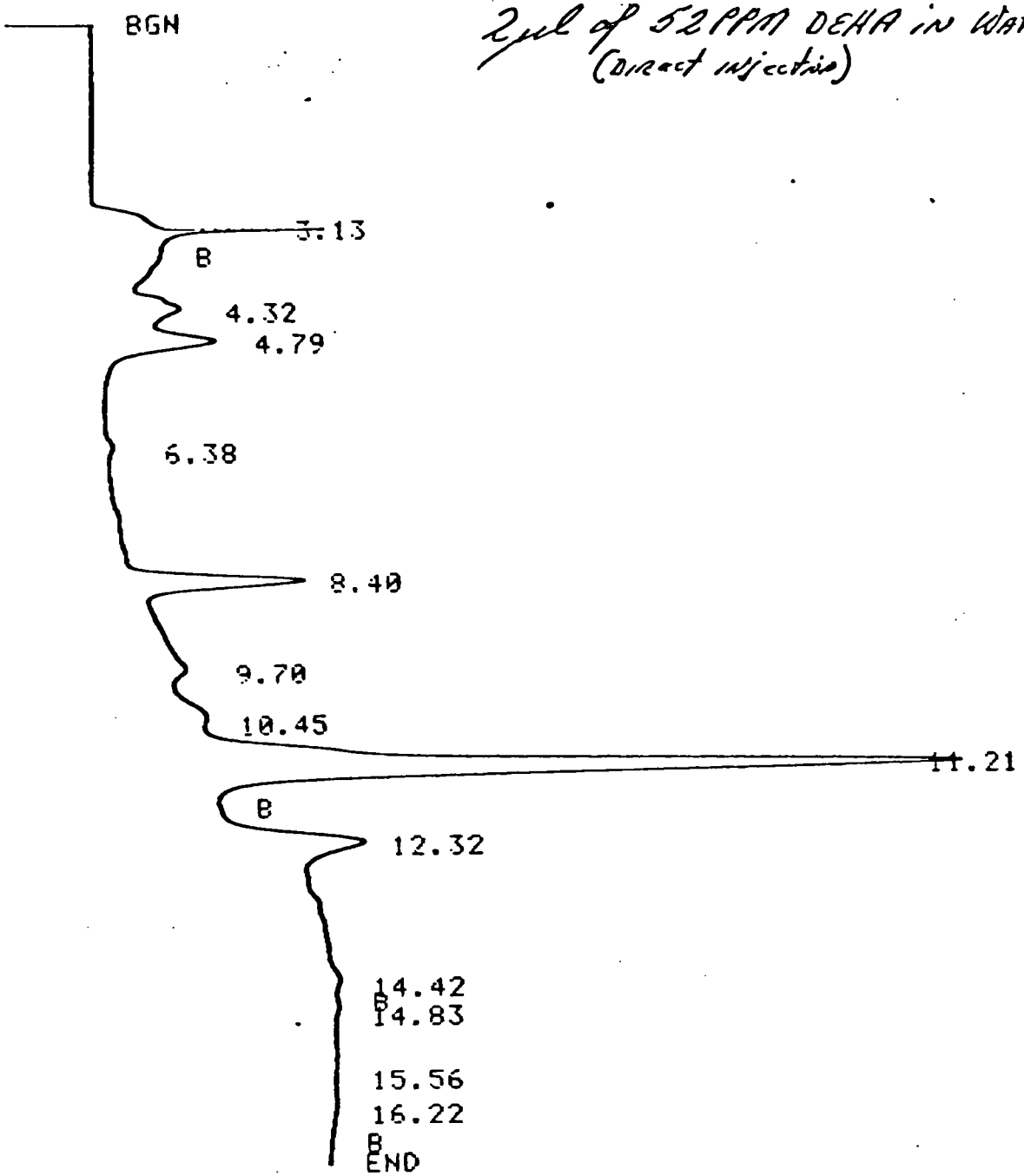
ATTachment #6

RUN 5 GLASS 6FT 2M...O DEHA COLUMN

ATTACHMENT NO 7
10 OF 15

SENSITIVITIES 200 20 NPO Range I Attn 3

2 µl of 52 PPM DEHA in Water (3 weeks old)
(direct injection)



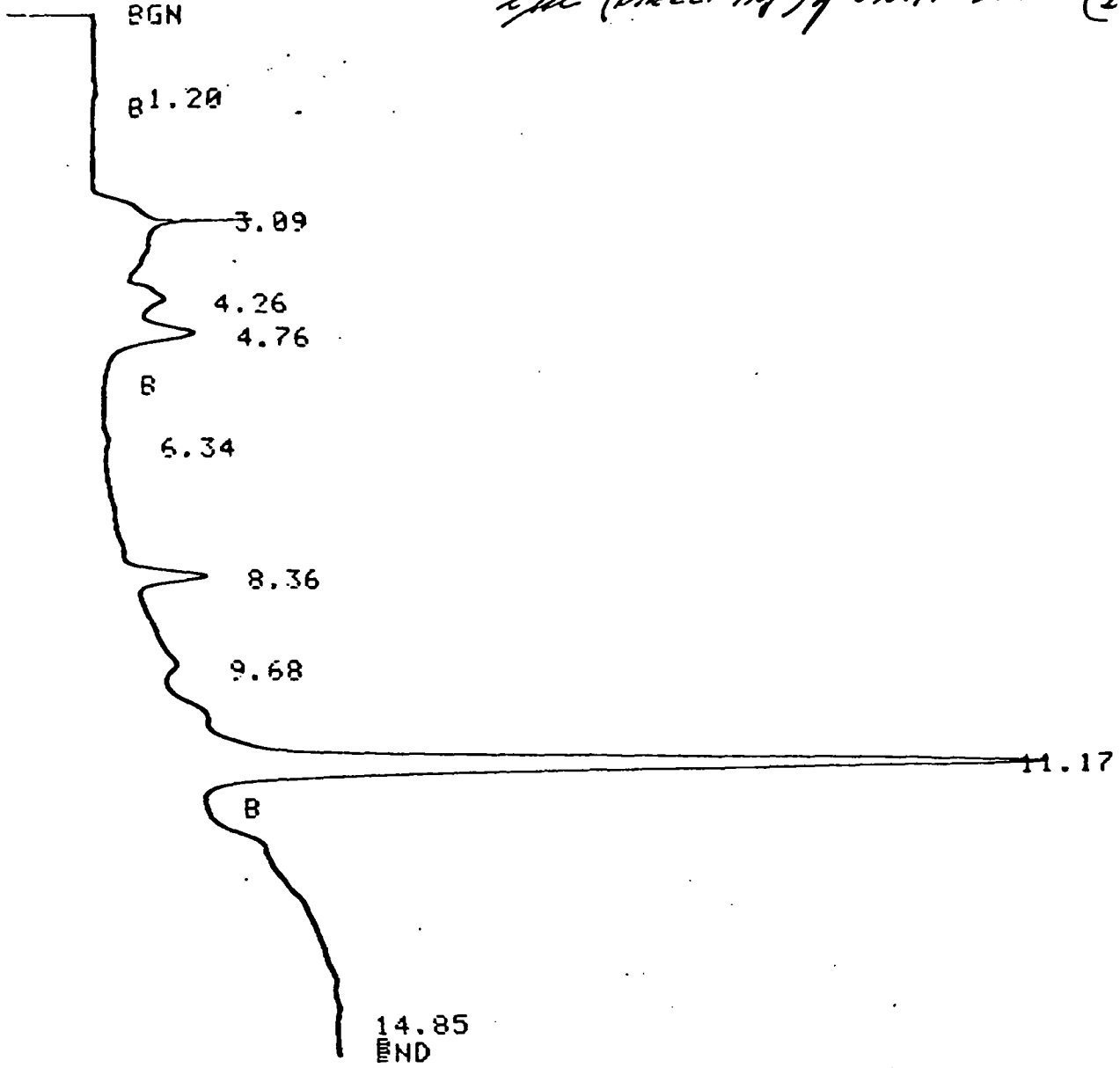
Attachment #7

RUN 7 GLASS 6FT 2 ID DEHA COLUMN

ATTACHMENT NO 7
11 OF 15

SENSITIVITIES 200 20 NPD Range 1 Atten 3

2 µl (Direct inj) of 620 ppm DEHA (1 Day old)



ATTACHMENT "D"

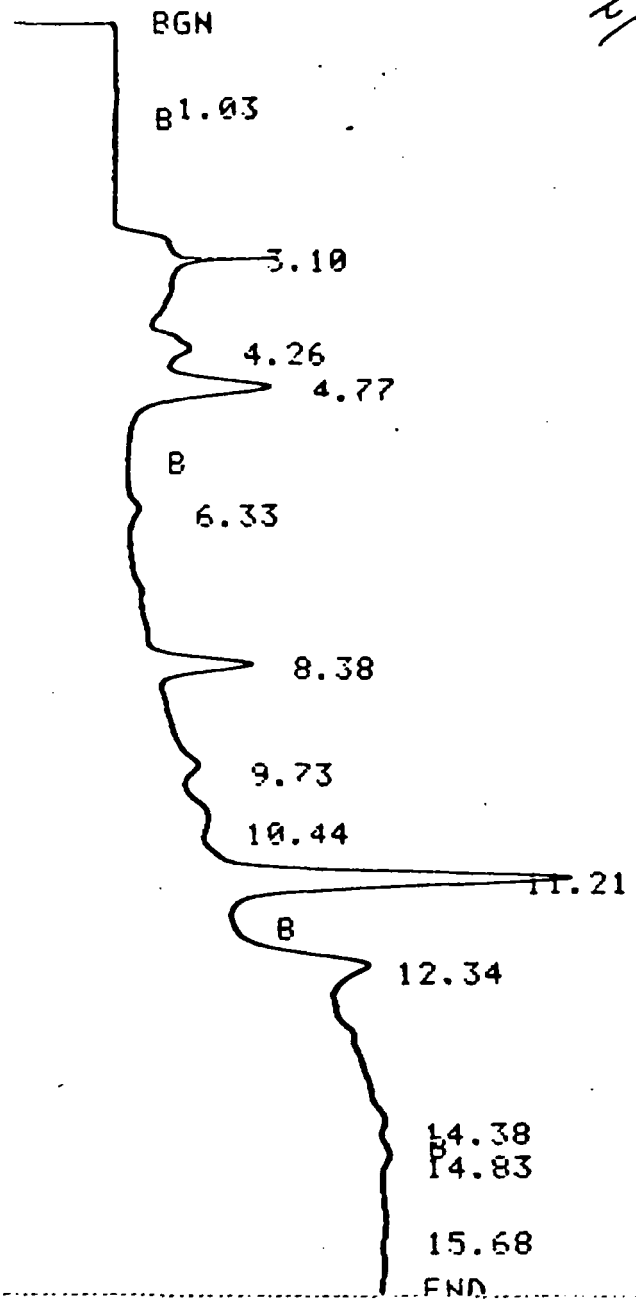
RUN 9 GLASS 6FT 2 ID DEHA COLUMN

ATTACHMENT NO 7
12 OF 15

SENSITIVITIES 200 20

NPD Range I Atten 3

2 µl (Direct injection) 18 PPM DEHA
(Fresh Mix) < 1 hr old



Attachment #9

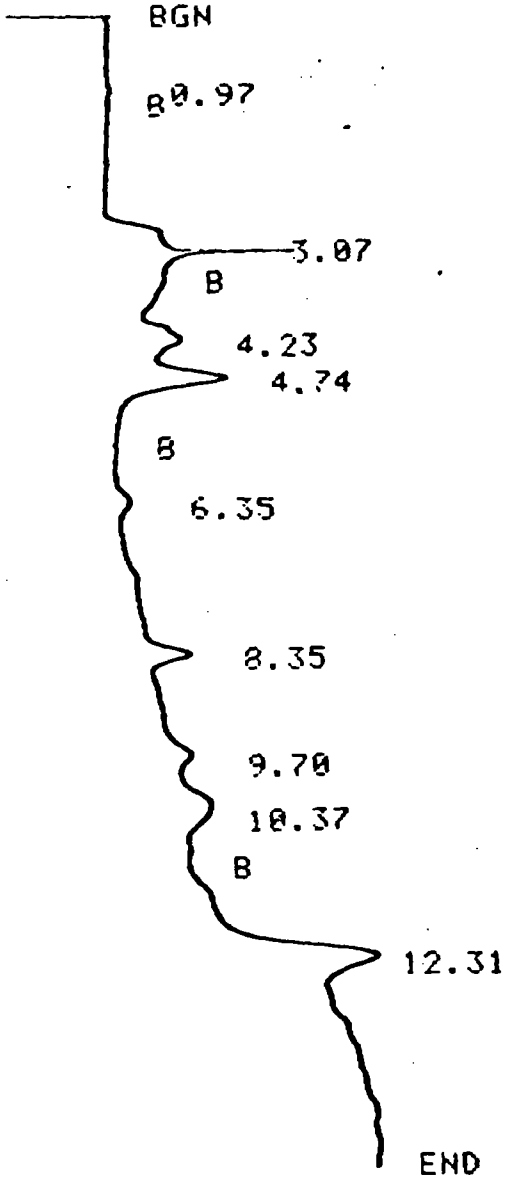
ATTACHMENT NO.7

13 OF 15

PUN 10 GLASS 6FT 2 ID DEHA COLUMN

SENSITIVITIES 200 20 NPD Range 2 Atten 3

2 µl (Direct injection) 18 PPM DEHA (18 Days old)



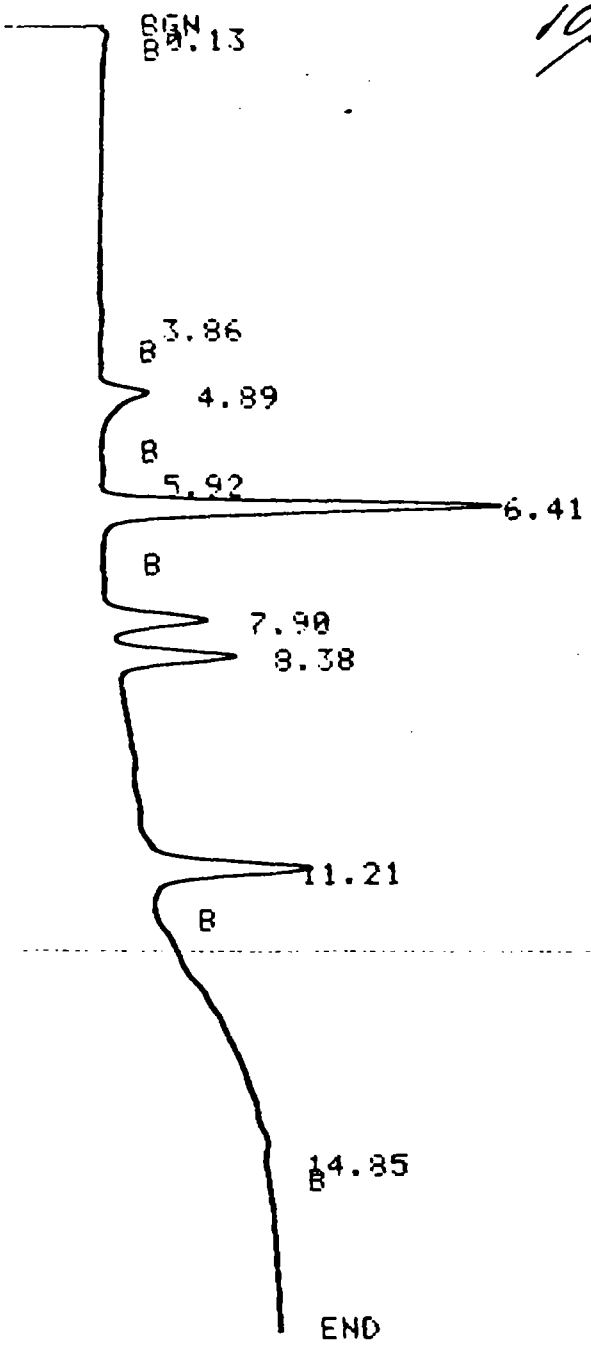
Attachment #10

RUN 13 GLASS 6FT 2M. .D DEHA COLUMN

SENSITIVITIES 200 20 NPD Range #1 Atten 3

ATTACHMENT NO. 7
14 OF 15

10µl (Injected in Dessobee/Trap)
18PPM DEHA in water
(Sample 1 Day old)



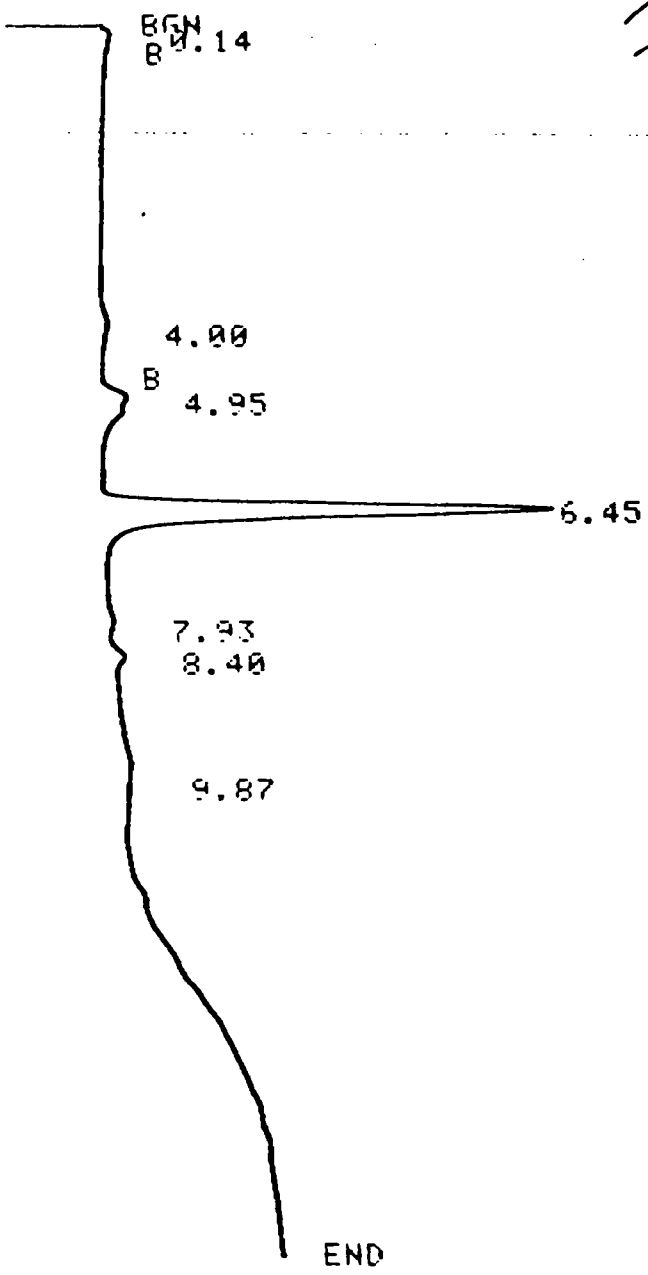
ATTACHMENT NO. 1
15 OF 15
Attachment #11

ANAL 1 DET 1 MET 2 2 FILE 51

RUN 12 GLASS 6FT 2MMID DEHA COLUMN

SENSITIVITIES 200 20 NPD Range I Atten 3

10µl (injected in December/Trip)
18PPM DEHA (18 Days old)



MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

January 14, 1981

TO: Robert Courchaine, Chief, Water Quality Division

FROM: Paul Zugger, Chief, Permit Enforcement Branch
Environmental Enforcement Division

RE: Proposed Final Order of Abatement
Pennwalt Corporation
Wyandotte, Michigan

Based on agreements reached at our meetings on January 5, 1981 and January 9, 1981, I have drafted additional language to be included in the proposed Final Order of Abatement.

Attached are additional paragraphs which should be inserted in page two of the proposed Final Order in lieu of paragraphs five through eight of that page of the proposed Final Order of Abatement. As we discussed, I will be presenting this matter to the Water Resources Commission on Thursday, January 15, 1981. With the Commission's concurrence, I suggest that the proposed document be placed on public notice and brought to the Commission for entry at the February meeting.

I feel the proposed Final Order represents a good settlement and I am hopeful this matter can be resolved promptly through the entry of this document.

PZ:dr

cc: Jack Bails
Stewart Freeman
Frank Baldwin

R. Schramek K.

RECEIVED
JAN 21 1981
PIE MOUILLEE S.G.A.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the pH limitations contained in the promulgated guidelines for the Inorganic Chemical industry subcategory are not applicable to the Pennwalt facilities.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the company continuously measures pH at all its process wastewater discharges.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that the EPA document entitled BACKGROUND DOCUMENT FOR MODIFICATION OF PH EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR POINT SOURCES REQUIRED BY NPDES PERMIT TO MONITOR CONTINUOUSLY EFFLUENT PH published November 1980 states "pH standards (6.0 - 9.0) whenever final effluent pH is required to be measured continuously may be beyond the capabilities of BPT and BCT systems."

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that, as evidenced by the company's December 18, 1979, demonstration of their existing pH control facilities, the pH limitations contained in this Final Order are appropriate.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources, that compliance with the pH limitations contained in this Final Order will insure full protection of the state's water quality standards and will protect the state's waters against pollution, impairment, or destruction.

IT IS AGREED BY ALL PARTIES, the Department of Natural Resources, the Water Resources Commission, and Pennwalt Corporation that in the absence of effective guidelines for pH, it is the judgement of the parties that the pH control facilities installed by the company constitute Best Practicable Control Technology Currently Available (B.P.C.T.C.A.). The parties also recognize that the United States Environmental Protection Agency (EPA) has neither made a final determination on this issue nor authorized the inclusion of the pH limitations contained herein in a revised NPDES permit for Pennwalt, and that a final determination by EPA on this issue may require modification of this Final Order or NPDES permit. In this event, either party may seek such modification.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission and the Michigan Department of Natural Resources that the Company has reviewed this Consent Order and while neither admitting nor denying that litigation of the issues would have resulted in a finding of the violations referred to in this Order or award of the damages set forth in this Order, has agreed to its entry as a Final Order of the Water Resources Commission.

MICHIGAN WATER RESOURCES COMMISSION

FACILITY INSPECTION REPORT

FACILITY	REGION	DISTR.		FACIL...	PERMIT	RATING
PENNWALT CORPORATION EAST PLANT 4655 BIDDLE AVE. WYANDOTTE MI 48192	1	1	104	820298	MI0002381	UNRELIAB

LAST VISIT		
TYPE	DESCRIPTION	DATE
1	ENFORCEMENT	01 / 78

VISIT REASONS

A - REGULAR SCHEDULE
B - EFFLUENT FAILURE
C - COMPLIANCE FAILURE
D - REGION REQUEST
E - FACILITY REQUEST
F - PUBLIC COMPLAINT
G - INFORMATION CHANGES
H - OTHER

OPERATOR - NUMBER	CERTIFIED
MACIAG DARRELL L	M001261

CURRENT VISIT			
REASON	DATE	FOLLOW-UP DATE	NO. OF VIS
A	01 12 80	M M D D Y Y	01

FACILITY NOT CLASSIFIED FACILITY CLASSIFICATION: A1b, A2f, B1b
OPERATOR CLASSIFICATION: A1B

Contact: Bob Heineman, Jack Lewis

X Rating for this facility: A

OUTFALL NUMBERS AND DESCRIPTIONS

820190	002	DISCHARGE TO DETROIT RIVER
820193	003	DISCHARGE TO DETROIT RIVER
820223	005	TREATED PROCESS WASTES PRIOR TO MIXING
820224	001	DISCHARGE TO WYE STREET STORM SEWER
820298	000	TOTAL CHLORIDE LOADING 001 002 003 & 005
820409	000	INTAKE
821044	049	DEEP DISPOSAL WELL 4
821045	047	DEEP DISPOSAL WELL 15
821046	048	DEEP DISPOSAL WELL 6
821068	006	DISCHARGE TO MONGUAGON CREEK

The report on the survey conducted on July 7-8, 1980 was delivered to Mr. Heineman and discussed. Mr. Heineman feels that the reason the company's results were higher than the survey crew's at the intake was that the company's sampling tube was dirty. He said it would be cleaned as soon as possible.

The production facilities, wastewater treatment and monitoring stations, storage areas and the outfalls were toured at both the East and West Plants. At the time of my inspection, al outfalls were within permit limits.

Outfall 001 or Wye Street sewer receives noncontact cooling water from the chlorine plant (chillers and compressors). There is no treatment at this outfall. The effluent was clear and oil free.

Outfall 002 receives process waste from the chlorine cell room. Treatment consists of pH adjustment (CO_2, H_2SO_4 or lime addition) and agitation. The effluent was clear and containe no visible oil.

Outfall 003 receives process waste from the ferrous chloride and anhydrous ferric chloride

INSPECTED BY: _____

ANY CHANGES REQUIRED IN WISER FILE

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

JAN 13 1981

PTE. MOUILLEE S.G.A.

INTEROFFICE COMMUNICATION

Janaury 13, 1981

TO: Roy Schrameck

FROM: Karl Zollner, Jr.

SUBJECT: Pennwalt Corporation

The intent of the following memorandum is to provide a file documentation of the notes I took Friday, January 9, 1981, meeting regarding the Pennwalt Corporation. You and I were both in attendance at that meeting. Also in attendance were Mr. Zugger, Mr. Batchelor and Ms. Harris of the Environmental Enforcement Division and Mr. Courchaine, Mr. Baldwin, Mr. Ross, Ms. Dixon and Mr. Bek of the Water Quality Division

Since the last meeting staff had regarding this matter, it has been determined that there are promulgated BPT guidelines for pH for this particular industrial category. You argued that those guidelines for pH limits (6.0-9.0) were limits for analyses of grab samples, not continuous monitoring samples. This was the whole purpose of EPA coming up with those new limits for continuous pH monitoring situations.

You indicated that multi-stage feed neutralization and a diversion system is what EPA has determined is BPT. The Company has installed a multi-stage feed neutralization system, but does not have room, because of physical constraints, for a diversion system for all of their outfalls.

You indicated you would evaluate the Company's past pH data to attempt to show that our proposed pH range limits would be more restritive on the Pennwalt Corporation than EPA's proposed limits for continuous pH monitoring would be. It was indicated that we should state clearly in the Order that in our judgment, that the pH treatment technology installed by the Company is the equivalent of BPT.

There was much discussion as to whether we should only issue the Order at this time or should issue both the Order and a reissued NPDES permit. If we do not reissue the permit, the current permit will remain in full force and effect except that compliance with certain sections of the Order should be indicated to also constitute compliance with corresponding sections of the permit. The consensus seemed to be that the permit should not be reissued until after EPA promulgates their final guidelines for pH where pH is continuously monitored.

There was also considerable discussion as to whether or not to take this issue to the Water Resources Commission at this month's meeting. It was decided that a briefing will be made to the Commission on the uniqueness of the pH limits in the proposed Order and asking them to approve the public noticing of the Order. After you complete your review of the pH treatment technology, we are to inform the Company that the permit remains in effect since we have an application on hand for permit reissuance. That letter should probably point out to the Company what the proposed EPA pH limits will require.

clp

cc: P. Zugger
R. Courchaine/F. Baldwin/WQD Files

PENNWALT CORPORATION
4655 BIDDLE AVENUE, WYANDOTTE, MICHIGAN 48192 · (313) 285-9200

January 9, 1981

State of Michigan
Department of Natural Resources
Data Center
Box 30028
Lansing, Michigan 48909

Re: Pennwalt Wyandotte Plant
NPDES Permit No. MI 0002381
Final Order of Abatement No. F.O. 1931

Gentlemen:

The Monthly Operating Report for the month of December 1980 is enclosed. Please note the following incidents of apparent non-compliance.

Outfall #820190 (002)

Permit limitation for pH - 6.5 minimum, 9.5 maximum.

	Raw Basis	Adjusted Basis
Continuous monitoring on 12/1	6.0	No excursion
12/2	2.6	
12/8	9.8	No excursion
12/9	6.0-10.0	No excursion
12/10	5.9	No excursion
12/12	6.2-10.0	No excursion
12/15	2.5	No excursion
12/16	1.9-10.0	No excursion
12/17	6.2-12.1	No excursion
12/20	3.9	No excursion
12/23	5.9	No excursion
12/26	6.4	No excursion
12/27	6.1	No excursion
12/29	6.3	No excursion
12/30	5.5-10.3	No excursion

The adjusted basis allows 5% of a 24 hour period for short duration pH spikes. The outfall was in pH compliance 99.3% of December.

RECEIVED
JAN 12 1981
W.C COMPLIANCE

xc: R. Schmaeck
Paul Zugger

JAN 13 1981
PTE. MOUILLEE S.G.A.

Outfall #820223 (005)

Permit limitation for pH - 6.5 minimum, 9.5 maximum.

	Raw Basis	Adjusted Basis
Continuous monitoring on 12/10	11.7	No excursion
12/11	2.6	No excursion

The adjusted basis allows 5% of a 24 hour period for short duration pH spikes. Both of these incidents appear related to a period of repair to the reagent supply system. The outfall was in compliance 99.9% of December.

We again submit analytical data for iron concentration in the east plant pond inlet and outlet.

	ug/l	
Date	Inlet	Outlet
12/1	4670	380
12/2	6874	820
12/3	5740	350
12/4	4820	420
12/5	5380	330
12/8	7580	360
12/9	4150	370
12/10.	1420	180
12/11	3000	470
12/12	3340	300
12/14	2350	140
12/15	3180	33
12/16	3490	300
12/18	3700	270
12/19	3350	210
12/21	3430	370
12/22	4540	350
12/23	3940	460
12/26	3310	290
12/28	4560	300
12/29	3100	200
12/31	3830	290

Outfall #821381 (006)

Permit limitation for pH - 6.5 minimum, 9.5 maximum.

	Raw Basis	Adjusted Basis
Continuous monitoring on 12/17	5.9	
12/25	6.4	No.excursion

Adjusted basis allows 5% of a 24 hour period for short duration pH spikes. Both incidents are believed related to control system maintenance.

Outfall # 821381 (006) (Cont'd.)

Permit limitation for pH - 6.5 minimum, 9.5 maximum. (Cont'd.)

The outfall was in compliance 99.6% of December.

Permit limitation for NH_3-N - 3.0 mg/l or 250 lbs/day maximum.

Grab sample on	12/5	4.10 mg/l - 266 lbs/day
	12/8	9.40 mg/l - 634 lbs/day

These apparent excursions may have resulted from operating difficulties in Process 44.

Permit limitation for BOD_5 - 576 lbs/day maximum.

Composite samples on 12/2 647 lbs/day

The DNR and Pennwalt are currently negotiating new limits for this parameter.

Very truly yours,

PENNWALT CORPORATION

John J. Lewis
Supervisor, Environmental Affairs
Wyandotte Plant

JJL:em

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

January 7, 1981

TO: Roy Schrameck

FROM: Karl Zollner, Jr. KZ

SUBJECT: Pennwalt Corporation, Wyandotte

On January 5, 1981 I attended a meeting in Mr. Courchaine's office to discuss staff's future actions regarding the Pennwalt Corporation. In addition to Mr. Courchaine, those in attendance included Paul Zugger, David Bachelor, Valerie Harris of the Environmental Enforcement Division and Frank Baldwin and myself of the Water Quality Division. The following are a copy of the brief notes I took at that meeting to provide you information as to what took place.

We are now at a point where the Department and the Attorney General's Office are near reaching a settlement with the Pennwalt Corporation. It is anticipated that our proposed Order will be objected to by the U.S. EPA because of the proposed pH limits. More specifically, it is anticipated that EPA will object to the percentage of time that our Order would allow a pH outside of the pH range specified in the Order and in a revised NPDES permit. Paul Zugger feltwe should proceed with the issuance of the Order over the objections of the U.S. EPA.

Frank Baldwin recommended that we public notice both the Order and a proposed NPDES permit for reissuance at the same time. It was decided that these would be discussed before the Water Resources Commission at this month's meeting. Frank suggested they both (the Order and permit) be public noticed this week. Paul disagreed feeling they should not be public noticed until after we make our presentation to the Water Resources Commission. It was decided that you or a member of your staff should prepare a summary and make the technical presentation to the Water Resources Commission as to the reasons we feel the Company has installed BPT regarding pH control. Your summary should also describe the percentages of time that the pH would be allowed outside of set limits and why these are appropriate.

We will send a copy of both the proposed Order and permit to the U.S. EPA detailing our reasons why we feel the Company has provided BPT for pH control and why our proposed pH limits are reasonable. In the letter of transmittal we will inform them that we are willing to discuss this matter with them. If they continue to object to the issuance because of the proposed pH limits, we will proceed with the issuance of the Order because this is a State document but will not reissue the NPDES permit over their objection. EPA could then issue that specific permit with their desired pH limits. It is anticipated that the Pennwalt Corporation would then adjudicate that permit with the U.S. EPA, indicating that they have installed BPT.

There was also considerable discussion on the proposed additional penalties that are to be imposed on the Pennwalt Corporation. There apparently has been some disagreement among the staff but this has been resolved. The Company paid a $150,000 penalty at the time the original Order was issued. Since that time they have paid additional penalties of approximately $180,000. A calculated amount of additional penalty from the date of issuance of the original Final Order to the date that the Company installed new treatment technology has been determined to be $211,000. It is proposed to give them credit for the additional $180,000 that they have already paid leaving a balance of an additional $31,000 yet to be paid according to the proposed settlement. It is anticipated that EPA may also object to our proposed additional penalty.

KZ/vls
cc: Robert J. Courchaine/Frank Baldwin
Paul Zugger

PENNWALT CORPORATION, EAST PLANT
Wyandotte, Michigan
MI 0002381

The Pennwalt Corporation (East Plant) is engaged in the production of industrial inorganic chemicals namely calcium hypochlorite, chlorine, caustic, hydrochloric acid, and ferric chloride. Production figures have been requested to be held in confidence.

A description of the various outfalls is as follows:

001 - Cooling water from calcium hypochlorite plant and of noncontact cooling from chlorine liquification plant. Total 9.6 MGD (revised application)

002 - Contact barometric condenser water and noncontact cooling water from sodium hydroxide evaporation department and contact cooling from chlorine cell. Total 19.3 MGD

003 - Noncontact cooling from chlorine cell, HCl, ferric chloride, and anhydrous caustic departments, 7.5 MGD

004 - # 3 anhydrous and ammonia units have been discontinued, no discharge from 004.

005 - Process wastes from calcium hypochloride, sodium hydroxide evaporation, fitting and shipping, anhydrous sodium hydroxide, and sodium silicate and brine purification departments. (1.6 MGD)

Initial Effluent

001 - Staff monitoring results for suspended solids averaging 19 mg/l with 30 maximum used 24 average, 35 maximum to allow for minimum-average variation. Flow value of 9.6 mgd maximum from company's monthly operating reports and revised application.

002 - Staff monitoring for total suspended solids using a maximum of 48 mg/l - 50 mg/l. Flow value of 19.3 mgd maximum from revised application.

003 - District staff recommendation that 50 mg/l total suspended solids maximum can be met. Flow of 7.5 mgd maximum from application. Total copper value used on a maximum based upon average of 0.117 mg/l average in application. Total iron limit based upon staff monitoring.

004 - Discontinued.

005 - Total suspended solids based upon revision of waste survey, operating reports, and staff samples. Flow from maximum given in application. Ammonia limits set based upon flow through bio-assey.

Final Limitations

Guidelines for the inorganic chemicals industry became effective May 14, 1974. Subpart F apply to the Chlorine and caustic production facilities and subpart G for the hydrochloric acid production. No guidelines are specified for the other production facilities.

Subpart F - Chlorine and sodium hydroxide

Parameter	Average	Maximum
Total Suspended Solids	0.32 lbs/1000 lbs	0.64 lbs/1000 lbs
Lead	0.0025 lbs/1000 lbs	0.005 lbs/1000 lbs
pH range 6.0 - 9.0		

Subpart G - Hydrochloric Acid

BPCTCA requires no discharge of pollutants

Due to the fact that wastes from the various production facilities are directed to one treatment system it is difficult to apply the specific guidelines to a particular process. Therefore, the most uniform guideline numbers were used and applied across the board based upon concentration values. The resultant load limitations were checked to insure that the guidelines limits for specific catagories were not exceeded.

Outfall 001 - Limits placed on waste water prior to mixing with noncontact cooling water

Outfall 002 - Limits placed upon contact barometric condenser water prior to mixing with noncontact cooling water.

Outfall 003 - Limits placed upon direct contact cooling water prior to mixing with noncontact cooling water. Anhydrous ammonia units # 1 and 2 have been shut down. Total suspended solids loading of 230 lbs/day average and 460 lbs/day maximum based upon concentration limit of 25 and 50 mg/l using flows of 0.2 mgd contact cooling from anhydrous caustic and sodium silicate flaking and cooling unit and 0.4 mgd contact cooling water from the ammonia chloride and agua HCL unit.

Outfall 005 - Limitations established based upon 25 mg/l average and 50 mg/l maximum for total suspended solids.

U.S. ENVIRONMENTAL PROTECTION AGENCY
EASTERN DISTRICT OFFICE
FIELD SAMPLING SURVEY PROPOSAL

FACILITY NAME Pennwalt Corp   LOCATION Riverview   SURVEY DATE 11/3/80

NPDES NO. MI0002381

SURVEY NO. 81 ELO2

Sample Number	Sample Point	Sample Point Description	FIELD: TEMP.	PH	D.O.	COND.	CHLORINE	FLOW	DISTRICT LAB: PH	COND.	BOD	TOT. SOLIDS	DIS. SOLIDS	SUSP. SOLIDS	HEX. CHORME	O & G	PHENOL	CYANIDE	CN-A	TOT. COLI.	FEC. COLI.
		Preservative Code							01							06	09	10		00	
S01	001	Niton SS	2/G	2/G		2/C	2/G	24/C	✓	✓				24/C		2/G					
S02	002	Ames & Bio #3	2/G	2/G		2/G	2/G	24/C	✓	✓				24/C		2/G					
S03	003	Ames & Bio #2	2/G	2/C		2/G	2/G	24/C	✓	✓				24/C		2/G					
S04	005		2/G	2/G		2/G	2/G	24/C	✓	✓				24/C		2/G					
S05	006	Ames & Bio #1	2/G	2/G		2/G	2/G	24/C	✓	✓	24/C			24/C		2/G	24/C				
S06	INF		2/G	2/G		2/G	2/G	✓/C	✓	✓	24/C			✓/C		2/G	C				
S07		Influent to Pond #1	2/C	2/C		2/C	2/C	G	✓	✓				24/C			C				
S08		" " " #1	2/G	2/G		2/G	2/C	G	✓	✓				C			C				
S09		" " " #2	2/C	2/C		2/C	2/C	G	✓	✓				C			C				
S10		" " Pond #4	2/C	2/C		2/C	2/C	C	✓	✓				C			C				
S11		Monguagon Creek Study															✓				

Sample Number	CENTRAL REGIONAL LAB: CHLORIDE	FLUORIDE	SULFATE	SULFIDE	NH3	$NO_2 + NO_3$	TKN	TOT. P.	COD	TOC
Preservative Code	01				04					
S01	C				C				C	
S02	C				C				C	
S03	C				C				C	
S04	C				C				C	
S05	C			2/G	C				C	
S06	C				C					
S07	C			2/G	C				C	
S08	C			2/G	C				C	
S09	C			2/C	C				C	
S10	C			2/G	C				C	
S11										

Sample Number	PLASMA	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn	Hg	P.C.B.	PESTICIDE	B.N.C.	AMES	BIO ASS.	VOA	Phenol/[illegible]
Preservative Code	07 (08)											OTA	03						
S01	C											C	✓	✓	✓	✓	✓	✓	✓
S02	C											C	✓	✓	✓	✓	✓	✓	✓
S03	C					C	C	C				C	✓	✓	✓	✓	✓	✓	✓
S04	C																		
S05	C										C	✓	✓	✓	✓	✓	✓	✓	✓
S06	C						C												
S07	C												✓	✓	✓			✓	✓
S08	C												✓	✓	✓			✓	✓
S09	C												✓	✓	✓			✓	✓
S10	C												✓	✓	✓			✓	✓
S11	✓												✓	✓	✓			✓	

THE DOWNRIVER NEWS HERALD - Wednesday, February 13, 1980

100 workers laid off at Pennwalt

The permanent shutdown of the dry caustic and detergent departments and the layoff of about 60 workers at Pennwalt Corp.'s Wyandotte Plant was announced last week.

The shutdown will take effect April 1. The announcement comes on the heels of the additional layoffs of about 40 workers at the Wyandotte facility, which have taken place in recent weeks.

The dry caustic and detergent departments are part of the operations at the east plant, located at the southern border of Wyandotte. Pennwalt also operates a west plant across Pennsylvania Avenue in Riverview.

The 40 previous layoffs affected workers in various depa nents in both the east and west works, according to a company spokesman.

In a written statement announcing the shutdown, Pennwalt stated "the growth of substitute products and the increased cost of manufacturing and shipping the products has led to a non-competitive situation" for dry caustic and detergents.

"We are experiencing a decrease in demand," said Plant Manager Edward Golinski. "What we're trying to do is make the future as secure as possible for the plant," he explained.

He said the dry caustic and detergent operations had not been competitive for a number of years.

According to Golinski, the 40 previous layoffs and the departments' shutdown are aimed at improving plant productivity.

In March, 1979 Pennwalt stopped production of perchlorate, a swimming pool chemical, resulting in the layoff of about 140 workers.

After the April 1 shutdown, Pennwalt's Wyandotte Plant will employ about 640 people, said Golinski.

Norbert Springer, president of United Steel Workers Local 1200 representing workers at the east plant, said even after the shutdown the east works will employ more workers than any other chemical division in the Pennwalt conglomerate.

Springer said the shutdown will also have an effect on the plant's skilled trades group and maintenance personnel, who will no longer have to service the closed departments.

The union is meeting with plant management today to negotiate for the employees affected by the closing, said Springer.

EPA

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
WATER RESOURCES COMMISSION

IN THE MATTER OF

Pennwalt Corporation
East Plant

NPDES PERMIT NO. MI 0002381

FINAL ORDER NO. 1931

WRC No.: NC-9-79-14-3215

NOTICE OF NONCOMPLIANCE AND ORDER TO COMPLY

TO: Pennwalt Corporation
4665 Biddle Avenue
Wyandotte, Michigan 48192

Attention: Mr. John J. Lewis, Supervisor, Environmental Control

PLEASE BE ADVISED that we have sufficient information to believe that your facility has failed to comply with the terms and conditions of your National Pollutant Discharge Elimination System Permit issued on June 20, 1975, and your Final Order of Abatement adopted against your Company on October 10, 1977.

PURSUANT to the terms of the aforementioned Order (Part I, Sections A.6, A.7, A.8, A.9, A.10), any discharge from your facility is limited to the following:

		Discharge Limitations			
		lbs/day		mg/l	
Effluent Characteristics	Outfall No.	Daily Average	Daily Maximum	Daily Average	Daily Maximum
Chloride Net #/Day	000*	-	500,000	-	-
Total Lead	002	1.37	2.75	-	-
Suspended Solids	002	1,856	3,711	-	-
Total Iron	003	-	-	-	1.6
Total Lead	003	1.0	2.0	-	-
Suspended Solids	003	844	1,689	-	-
BOD_5	006	380	570	-	-
Ammonia Nitrogen	006	-	-	1.5	3.0
pH	002,003 005,006	The pH shall not be less than 6.5 nor greater than 9.5			

The monthly monitoring report submitted for the month of July 1979 shows that your facility exceeded its authorized discharge limits according to the following:

Date of Excursion	Outfall No.	Effluent Characteristics	Reproted Value
7-15-79	000*	Chloride-Net #/Day	527,092 lbs/day
July 1979	002	Total Lead	1.5 lbs/day
7-10-79	002	Suspended Solids	4,050 lbs/day
7-11-79	002	Suspended Solids	*6,291 lbs/day
7-12-79	002	Suspended Solids	4,408 lbs/day
7-23-79	002	Suspended Solids	4,050 lbs/day
7-25-79	002	Suspended Solids	4,623 lbs/day
7-26-79	002	Suspended Solids	7,247 lbs/day
7-30-79	002	Suspended Solids	4,998 lbs/day
7-3-79	002	pH	3.3 S.U.
7-9-79	002	pH	9.6 S.U.
7-9-79	002	pH	5.1 S.U.
7-10-79	002	pH	11.1 S.U.
7-10-79	002	pH	2.9 S.U.
7-11-79	002	pH	10.1 S.U.

Date of Excursion	Outfall No.	Effluent Characteristics	Reported Value
7-28-79	006	pH	10.6 S.U.

000* Total Chlorine loading 001, 002, 003 and 005
*July 1979 Monthly Operating Report shows 6,291 lbs/day of Suspended Solids at outfall 002 on July 11, 1979. However, the noncompliance notification submitted by the permittee shows 6,294 lbs/day of suspended solids at outfall 002 on July 11, 1979. Permittee is therefore required to confirm in writing which of the above data is correct for suspended solids at outfall 002 on July 11, 1979.

PURSUANT to the terms of the aforementioned permit (Part II, Section A.1): "All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit".

BE ADVISED that the excursions cited in this Notice of Noncompliance are a violation of your NPDES Permit No. MI 0002381.

PURSUANT to a letter dated August 10, 1979, the Pennwalt Corporation offered a written explanation for the effluent excursions cited in this Notice of Noncompliance. In that letter, the permittee attributed the excursion of chloride net pounds per day that occurred on July 15, 1979, to "temporary diversion of clarifloculator bottoms to the active pond".

BE ADVISED that the latter incident is a violation of Part II, Section A.7 that prohibits any diversions or bypass of facilities necessary to maintain compliance with the terms and conditions of your NPDES permit.

BE ADVISED that despite efforts by the Company toward resolution of these effluent problems and other matters, the violations continue. Pennwalt Corporation is hereby put on Notice that enforcement actions may be escalated if effluent violations persist.

WATER RESOURCES COMMISSION
MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Date Issued: September 21, 1979

Robert J. Courchaine
Executive Secretary

by: Robert F. Babcock, Chief
NPDES Effluent Compliance Unit

ADDRESS FOR FURTHER CORRESPONDENCE

Robert F. Babcock, Water Quality Administrator
Michigan Water Resources Commission
Water Quality Division/NPDES Compliance Section
P.O. Box 30028
Lansing, Michigan 48909
Telephone: (517) 373-1947

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, BOX 30028, LANSING, MICHIGAN 48909
HOWARD A. TANNER, Director

October 31, 1977

H. J. Withers
Plant Manager
Pennwalt Corp.
4655 Biddle Ave.
Wyandotte, MI 48192

Re: NPDES Permit No. MI 0002381
Final Order of Abatement No. FO 1981

Dear Mr. Withers:

On October 20, 1977, Final Order of Abatement Number F.O. 1981 for Pennwalt Corporation, Wyandotte, Michigan was entered by the Water Resources Commission and the Director of the Department of Natural Resources. Attached is a copy of the executed document.

Very truly yours,

WATER QUALITY DIVISION

Paul D. Zugger
Permit & Enforcement Coordinator

PDZ:sh
cc: S. Freeman
J. Bails
G. Reath
H.G. Sparrow, III
C. W. Gullickson
R. Courchaine
W. Denniston
J. Bohunsky

MICHIGAN
THE GREAT LAKE STATE

R1026 10/78

STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES

WATER RESOURCES COMMISSION

In the matter of abatement of water pollution: Pennwalt Corp., Wyandotte, Michigan

NPDES Permit No. MI 0002381

Final Order No. FO 1931

FINAL ORDER OF ABATEMENT

At a session of the Water Resources Commission, on August 19, 1977, at Marquette, Michigan, upon presentation by staff of the Water Quality Division, Department of Natural Resources, and based upon the official files of the Water Resources Commission:

IT IS THE EXPRESS FINDING OF FACT of the Water Resources Commission that Pennwalt Corporation hereinafter referred to as the Company, was issued NPDES Permit No. MI 0002381 on June 20, 1975 for its Wyandotte facility in Wyandotte, Michigan, which was revised by a further permit issued March 3, 1976, which said permit of March 3, 1976 was itself revised on May 21, 1976.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission that the Company has violated, and is violating, the expressed terms and conditions of NPDES Permit No. MI 0002381 by its continued inability fully to comply with the schedule of compliance as set forth in Part I, Section C on pages 17 and 18 of said permit, although it has complied with substantial portions of the said schedule of compliance.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission that the Company has violated, is violating, and may violate certain of the final effluent limitations contained in NPDES Permit No. MI 0002381.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission that on March 18, 1977 the Company stated some of the final effluent limitations found in NPDES Permit No. MI 0002381 could not be met on or before July 1, 1977.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission that as a result of deliberations between staffs of the Company, the Attorney General's Office and the Department of Natural Resources an amicable resolution of all issues has been reached.

IT IS FURTHER THE EXPRESS FINDING OF FACT of the Water Resources Commission that the Company has reviewed this Consent Order and while neither admitting nor denying that litigation of the issues would have resulted in a finding of the violations referred to in this Order or award of the damages set forth in this Order, has agreed to its entry as a Final Order of the Water Resources Commission.

IT IS FURTHER ORDERED that NPDES Permit No. MI 0002381, issued on June 20, 1975, as subsequently revised, is in full force and effect except as modified by this Final Order.

IT IS FURTHER ORDERED that the Company will control and monitor their wastewater from the date of issuance of this Final Order until the specified dates to obtain final effluent requirements in accordance with the limitations specified below:

RSC

1. Initial Effluent Limitations

During the period beginning upon the issuance of this permit, and lasting until September 30, 1977, the permittee is authorized to discharge from outfall 002. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3 x weekly	
Total Suspended Solids		3660 Net* (8050)Net*		50 mg/l Net*	3 x weekly	Grab
Total Chlorine Residual				50 mg/l	3 x weekly	Grab
Chlorides					3 x weekly	Grab
Ammonia (as N)					Weekly	Grab
Oil and Grease			No Visible Film		Daily	Visual Observatic
Temperature					3 x weekly	Grab
Total Lead					Twice Monthly	Grab
COD					Weekly	Grab

a. The pH shall not be less than 6.5 nor greater than 11.0. The pH shall be monitored as follows: three times weekly; grab.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken prior to discharge to the Detroit River.

* Net is defined as the difference between intake and discharge values.

2. Initial Effluent Limitations

During the period beginning upon the issuance of this permit and lasting until March 31, 1978, the permittee is authorized to discharge from outfall 003. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3 x weekly	
Total Suspended Solids					3 x weekly	Grab
Ammonia (as N)					Weekly	Grab
Chlorides					3 x weekly	Grab
Total Copper		8.6(19)		0.3 mg/l	Twice Monthly	Grab
Total Iron		483 (1063)		17 mg/l	Twice Monthly	Grab
Total Lead		14 (31)		0.5 mg/l	Twice Monthly	Grab
Total Chlorine Residual				35 mg/l	3 x weekly	Grab
Oil and Grease			No Visible Film		Daily	Visual Observatio
Temperature					3 x weekly	Reading

a. The pH shall not be less than 5.0 nor greater than 11.0. The pH shall be monitored as follows: three times weekly; grab.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at outfall 003 prior to discharge to the Detroit River.

3. Initial Effluent Limitations - Treated Process Wastes

During the period beginning upon the issuance of this permit and lasting until March 31, 1978, the permittee is authorized to discharge treated process wastes from outfall 005. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					Weekly	
Total Suspended Solids	600 Net* (1334)Net*	900 Net* (2000)Net*	100 mg/l Net*	150 mg/l Net*	3 x weekly	Grab
COD		18196 (40032)		3000 mg/l	Weekly	Grab
Ammonia (as N)			1.0 mg/l	1.5 mg/l	Weekly	Grab
Total Chlorine Residual					3 x weekly	Grab
Chlorides					3 x weekly	Grab
Temperature					3 x weekly	Reading
Oil and Grease			No Visible Film		Daily	Visual Observat

a. The pH shall not be less than 6.5 nor greater than 12.5 . The pH shall be monitored as follows: three times weekly; grab .

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken prior to mixing with effluent from the Wyandotte-Wayne County Wastewater Treatment Plant.

* Net is defined as the difference between intake and discharge values.

4. Initial Effluent limitations - Total Chloride Loading

During the period beginning upon the issuance of this permit and lasting until March 31, 1978, the permittee is authorized to discharge from outfalls 001, 002, 003, and 005. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Maximum		Monitoring Requirements Measurement Frequency	Sample Type
Total Combined outfalls 001, 002, 003 & 005				
Chlorides	227,000 Net*	(500,000) Net*	3 x weekly	Calculat

* Net is defined as the difference between intake and discharge values.

5. Initial Effluent Limitations

During the period beginning on the effective date of this permit and lasting until January 31, 1978, the permittee is authorized to discharge from outfall 006. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3 x weekly	
BOD_5					Weekly	24 hr composite
COD	2634 (5806)	11183 (24603)			3 x weekly	24 hr composite
Total Suspended Solids		1118 Net* (2460)Net*		50 mg/l Net*	3 x weekly	grab
Chlorides		4000 Net* (8800)Net*			3 x weekly	24 hr composite
Phenol					3 x weekly	24 hr composite
Ammonia (as N)					3 x weekly	grab
Total Chlorine Residual					3 x weekly	grab
Oil and Grease			No Visible Film		Daily	Visual Observat
Total Zinc					Twice Monthly	24 hr comp.
Temperature					Weekly	Reading
Sulfide					Twice Monthly	24 hr comp.

a. The pH shall not be less than 3.0 not greater than 11.0 . The pH shall be monitored as follows: continuous - report daily maximum and minimum.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. Samples taken in compliance with the monitoring requirements above shall be taken at outfall 006 prior to discharge to Monguagon Creek.

*Net is defined as the difference between intake and discharge values.

IT IS FURTHER ORDERED that the Company will treat, control, and monitor their wastewater discharge to the extent necessary to achieve and maintain the final limitations and conditions specified below:

6. Final Effluent Limitations

During the period beginning October 1, 1977 and lasting until the expiration of this permit, the permittee is authorized to discharge barometric condenser water, floor wash water, and noncontact cooling water from outfall 002. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3 x weekly	
Chlorides					3 x weekly	24 hr composit
Oil and Grease			No Visible Film		Daily	Visual Observ.
Temperature					Daily	Reading
COD					3 x weekly	24 hr composit
Total Suspended Solids *	844 (1856)	1687 (3711)			Daily**	24 hr composit
Ammonia (as N)			1.4 mg/l	2.3 mg/l	3 x weekly	24 hr composit
Total Chlorine Residual			1.0 mg/l	1.5 mg/l	Daily	Grab
Total Lead	0.6 (1.37)	1.25 (2.75)			Twice Monthly	24 hr comp.

* The above limitations for Total Suspended Solids may be modified to a Net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4, herein.

** When discharging

The term noncontact cooling water shall mean water used for cooling which does not come into direct contact with any raw material, intermediate product, by product, waste product, or finished product.

a. The pH shall not be less than 6.5 nor greater than 9.5. The pH shall be monitored as follows: continuous; report daily maximum and minimum.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at outfall 002 prior to discharge to the Detroit River.

e. In the event the permittee shall require the use of Water Treatment additives, the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1.

7. Final Limitations

During the period beginning April 1, 1978 and lasting until the expiration of this permit, the permittee is authorized to discharge contact cooling water, process wastes, and non-contact cooling water from outfall 003. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3 x weekly	
Chlorides					3 x weekly	24 hr composit
Oil and Grease			No Visible Film		Daily	Visual Observ.
Temperature					Daily	Reading
Total Suspended Solids*	384 (844)	768 (1689)			5 x weekly	Grab
Ammonia (as N)			3 mg/l	5 mg/l	3 x weekly	24 hr composit
Total Copper				1.0 mg/l	Twice Weekly	24 hr compos
Total Lead	0.45 (1.0)	0.9 (2.0)			Twice Monthly	24 hr compos
Total Iron*				1.6 mg/l	Weekly	24 hr composit
Chlorine Residual			1.0 mg/l	1.5 mg/l	Daily	Grab

* The above limitations for Total Suspended Solids and Iron may be modified to a Net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4, herein.

The term noncontact cooling water means water used for cooling which does not come into direct contact with any raw material, intermediate product, by product, waste product, or finished product.

a. The pH shall not be less than 6.5 nor greater than 9.5. The pH shall be monitored as follows: continuous; report daily maximum and minimum.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken prior to discharging to the Detroit River.

e. In the event the permittee shall require the use of Water Treatment additives, the permittee shall notify the Michigan Water Resources Commission in accordance with the requirements of Part II, Section A-1.

8. Final Limitations

During the period beginning April 1, 1978 and lasting until the expiration of this permit, the permittee is authorized to discharge from outfall 005. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					Continuous	
Total Suspended Solids*	212 (467)	425 (934)	35 mg/l	70 mg/l	5 x weekly	Grab
COD		821 (1801)			3 x weekly	24 hr composi
Ammonia (as N)			1.0 mg/l	1.5 mg/l	3 x weekly	24 hr composi
Total Chlorine Residual			1.0 mg/l	1.5 mg/l	Daily	Grab
Chlorides					3 x weekly	24 hr composi
Total Lead	0.6 (1.4)	1.2 (2.7)	0.1 mg/l	0.2 mg/l	Twice Monthly	24 hr comp.
Temperature					Daily	Reading
Oil and Grease			No Visible Film		Daily	Visual Observation

* The above limitations for Total Suspended Solids may be modified to a net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4, herein.

a. The pH shall not be less than 6.5 nor greater than 9.5. The pH shall be monitored as follows: continuous - report daily, maximum and minimum.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken prior to mixing with effluent from the Wyandotte-Wayne County wastewater treatment plant, at Outfall 005.

9. Final Limitations

During the period beginning February 1, 1978 and lasting until the expiration of this permit, the permittee is authorized to discharge from outfall 006. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Average	Daily Maximum	Other Limitations Daily Average	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, M^3/Day (MGD)					3 x weekly	
BOD_5 *	173 (380)	259 (570)			3 x weekly	24 hr composit
COD					3 x weekly	24 hr composit
Total Suspended Solids	173Net (380)Net	259Net (570)Net			3 x weekly	24 hr composit
Chlorides		4000Net (8800)Net			3 x weekly	24 hr composit
Ammonia (as N)		114 (250)	1.5 mg/l	3.0 mg/l	3 x weekly	Grab
Total Chlorine Residual				0.5 mg/l	3 x weekly	Grab
Phenol		4.5 (10)		0.2 mg/l	3 x weekly	24 hr composit
Sulfide					Weekly	24 hr composit
Temperature					3 x weekly	Reading
Total Zinc				1.0 mg/l	Twice Monthly	24 hr comp.
Oil and Grease			No Visible Film		Daily	Visual Observ.

* The above limitations for BOD may be modified to a Net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4, herein.

a. The pH shall not be less than 6.5 nor greater than 9.5. The pH shall be monitored as follows: continuous - report daily maximum and minimum.

b. The discharge shall not cause excessive foam in the receiving waters. The discharge shall be essentially free of floating and settleable solids.

c. The discharge shall not contain oil or other substances in amounts sufficient to create a visible film or sheen on the receiving waters.

d. Samples taken in compliance with the monitoring requirements above shall be taken at outfall 006 prior to discharge to Monguagon Creek.

10. Final Effluent Limitations - Total Chloride Loading

During the period beginning April 1, 1978 and lasting until the date of expiration of this permit, the permittee is authorized to discharge from outfalls 001, 002, 003 and 005. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations kg/day (lbs/day) Daily Maximum	Monitoring Requirements Measurement Frequency	Monitoring Requirements Sample Type
Total Combined outfalls 001, 002, 003 and 005			
Chlorides*	227,000 (500,000)	3 x weekly	Calculation

* The above limitations for chlorides may be modified to a Net value upon demonstration to the Chief of the Water Quality Division that gross values are unattainable due to technical or economic considerations. Such modification shall be made in accordance with Part II, Section B-4 herein.

IT IS FURTHER ORDERED that Part I-C Schedule of Compliance of NPDES Permit No. MI 0002381 issued June 20, 1975 is modified as follows:

C. SCHEDULE OF COMPLIANCE

Outfall 002

a. Complete construction of said facilities on or before September 10, 1977.

b. Attain operational level necessary to meet the limitations specified herein on or before October 1, 1977.

Outfalls 003 and 005

a. Submit progress report to the Chief of the Water Quality Division specifying the status of construction on or before September 30, 1977.

b. Submit progress report to the Chief of the Water Quality Division specifying the status of construction on or before October 31, 1977.

c. Submit progress report to the Chief of the Water Quality Division specifying the status of construction on or before November 30, 1977.

d. Complete construction of said facilities on or before December 31, 1977.

e. Attain operational level necessary to meet the limitations specified herein on or before April 1, 1978.

Outfall 006

a. Submit progress report to the Chief of the Water Quality Division specifying the status of construction on or before September 30, 1977.

b. Submit progress report to the Chief of the Water Quality Division specifying the status of construction on or before October 31, 1977.

c. Submit progress report to the Chief of the Water Quality Division specifying the status of construction on or before November 30, 1977.

d. Complete construction of said facilities on or before December 31, 1977.

e. Attain operational level necessary to meet the limitations specified herein on or before February 1, 1978.

No later than 14 calendar days following a date identified in the above schedule of compliance, the Company shall submit either a report of progress, or in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case the notice shall include the cause of noncompliance, any remedial actions taken and the probability of meeting the next scheduled requirement. As to any interim date set forth herein the Chief of the Water Quality Division of the Department of Natural Resources may extend compliance for good cause shown, for up to 90 days without necessity of the approval of the Water Resources Commission.

IT IS THEREFORE ORDERED that this Final Order will take effect on 1977, and shall be effective until May 30, 1980.

RSC

The Pennwalt Corporation is hereby put on notice that but for this Final Order, the Company might be subject to the Civil Penalty provisions provided by law for failure of the Company to be in full compliance by the mandated July 1, 1977, date. The Pennwalt Corporation and the Department of Natural Resources hereby agree that the Company shall forthwith pay as liquidated damages the sum of One Hundred and Fifty Thousand Dollars ($150,000) to the General Fund of the State of Michigan. In addition to the above amounts, the Company agrees to pay the following liquidated damages:

a. For those days beyond September 30, 1977 that the discharge from Outfall 002 is in violation of the Daily Maximum Final Effluent Limitations for Outfall 002 specified herein: Two Thousand Dollars ($2,000) per day.

On January 15, 1978 the Company shall notify the Department of Natural Resources in writing of each day since September 30, 1977 for which the $2,000 is payable under this subsection of this Order. The Company shall contemporaneously pay such amounts (if any) then accrued to the State.

b. For those days beyond December 31, 1977 during which the discharges from Outfalls 003 and 005 are not treated by waste treatment facilities installed in accordance with approved plans specified in Schedule of Compliance C-2, herein: Two Thousand Dollars ($2,000) per day. There shall be no payments required under this subsection for days during which there is no discharge, nor when final effluent limits are achieved.

Beginning February 15, 1978, and on the fifteenth day of each month thereafter (through July 15, 1978) the Company shall notify the Department of Natural Resources in writing of each day of the preceding calendar month for which the $2,000 is payable under this subsection of this Order. The Company shall contemporaneously pay such amounts (if any) then accrued to the State.

c. For those days beyond March 31, 1978 that the discharges from Outfalls 003 and 005 are in violation of the Final Effluent Limitations specified for said outfalls: Two Thousand Dollars ($2,000) per day.

Beginning May 15, 1978, and on the fifteenth day of each month thereafter (through July 15, 1978) the Company shall notify the Department of Natural Resources in writing of each day of the preceding calendar month for which the $2,000 is payable under this subsection of this Order. The Company shall contemporaneously pay such amounts (if any) then accrued to the State.

A violation of the final effluent limitations for Outfall 002 after January 1, 1978, or for Outfall 006 after February 1, 1978, or for Outfalls 003 and 005 after July 1, 1978 is a violation of this Final Order.

The State may seek other and further relief for noncompliance conducted after any final compliance date specified in this Order.

Pennwalt Corporation is hereby put upon notice by the Commission that any material failure to comply with this Final Order may, and probably will, result in prompt enforcement action. A violation of any date in any of the schedules of compliance specified herein is a violation of the total Order. Nothing in this Order is, however, intended to or shall deprive Pennwalt Corporation of its right or privilege to petition the Water Resources Commission or such other authority as may be appropriate for review of any such violation.

This Final Order entered on _____ by direction of the Michigan Water Resources Commission and the Director of the Department of Natural Resources. The Commission and the Department retain jurisdiction to modify this Order or enter such further Orders as the facts and circumstances may warrant.

Stanley K. Pruss
Chairman

Approved as to Form and Substance:

Pennwalt Corporation

by: Robert S Custer
Title: VICE PRESIDENT

Dated: OCTOBER 10, 1977

Approved as to Substance:

Robert J. Courchaine
Chief, Water Quality Division

Dated: 10/17/77

Approved as to Form:

Frank J. Kelley
Attorney General

Stewart H. Freeman
Assistant Attorney General

Dated: Oct. 14, 1977

Approved for Entry:

Michigan Department of Natural Resources

Howard A. Tanner
Director

Bowles

File R105 S

PUBLIC NOTICE

Michigan Water Resources Commission

Box 30028

Lansing, Michigan 48909

(517) 373-8448

Date: January 23, 1981

Permit Number: MI 0002381

NOTICE: Pennwalt Corporation presently has a valid National Pollutant Discharge Elimination System (Public Law 92-500) Permit, issued June 20, 1975, to discharge treated process wastes and cooling water from its facility located at 4655 Biddle Ave., Wyandotte.

The applicant is engaged in the manufacture of organic chemicals. The plant discharges its effluent to the Wye Street Storm Sewer, the Detroit River, and Monguagon Creek (Huntington Drain) a tributary to the Detroit River.

The National Pollutant Discharge Elimination System Permit issued to Pennwalt Corporation required the permittee to meet certain effluent limitations and a defined schedule for the construction of new or additional wastewater treatment facilities and to attain operational level of these facilities on or before the mandated date of July 1, 1977.

It was determined that the Permittee did not comply with the mandated requirement of July 1, 1977, at the above cited location. A Final Order of Abatement, FInal Order No. 1931 was entered in October 1977 modifying the schedule of compliance contained in the NPDES Permit.

It has been determined that the permittee did not comply with the terms and conditions of Final Order No. 1931.

It is hereby noticed that the Michigan Water Resources Commission and Michigan Department of Natural Resources intended to initiate formal enforcement proceedings against the permittee for its failure to comply with Final Order No. 1931. However, enforcement proceedings will not be initiated if the Permittee agrees, stipulates and consents to the entry of a Final Order of Abatement which directs and requires the Permittee to adhere to and comply with conditions of the NPDES Permit as modified by the Final Order.

The Permittee has been notified of its apparent violation with the terms and conditions of NPDES Permit No. MI 0002381 as modified by Final Order No. 1931 and has agreed to waive its right to an administrative hearing and enter into a Final Order of the Michigan Water Resources Commission.

The determination to enter the Final Order is tentative. Persons wishing to comment upon, or object to, the proposed Final Order are invited to submit the same in writing to:

Department of Natural Resources
Water Quality Division
Surface Water Compliance Section
P.O. Box 30028
Lansing, Michigan 48909

The name of the Permittee and permit number should appear next to the above address on the envelope and on the first page of any submitted comments. All comments received within thirty (30) days of the date of issuance of this public notice will be considered in the final determination. If no written objections are received, the Michigan Water Resources Commission will make its final determination within sixty (60) days of the date of this notice.

The proposed Final Order, and other information, are on file and may be inspected at the Water Quality Division Offices, 8th Floor, Stevens T. Mason Building, Lansing, Michigan and at the District Office located at R #3, 37205 Mouillee Road, Rockwood, Michigan 48173, at any time between 9:30 a.m. and 3:30 p.m. Monday through Friday. Copies of all other information are available at a cost of 5¢ per page.

Please bring the foregoing to the attention of any persons whom you know would be interested in this matter.

ej

CARDOX

Division of Ch etron Corporation
P. O. Box 70t 230 S. East Ave.
Countryside, Illinois 60525
Telephone 312/482-8400

March 24, 1981

Gentlemen:

Thank you very much for your inquiry. We have enclosed our technical literature on using carbon dioxide for water treatment.

If you have any questions, please feel free to call or write us at the above address.

Sincerely,

CARDOX Division
Chemetron Corporation

John R. Cahill
Applications Engineer

JRC:mb
Encls.

CARDOX

tech specs

number: 1023-F

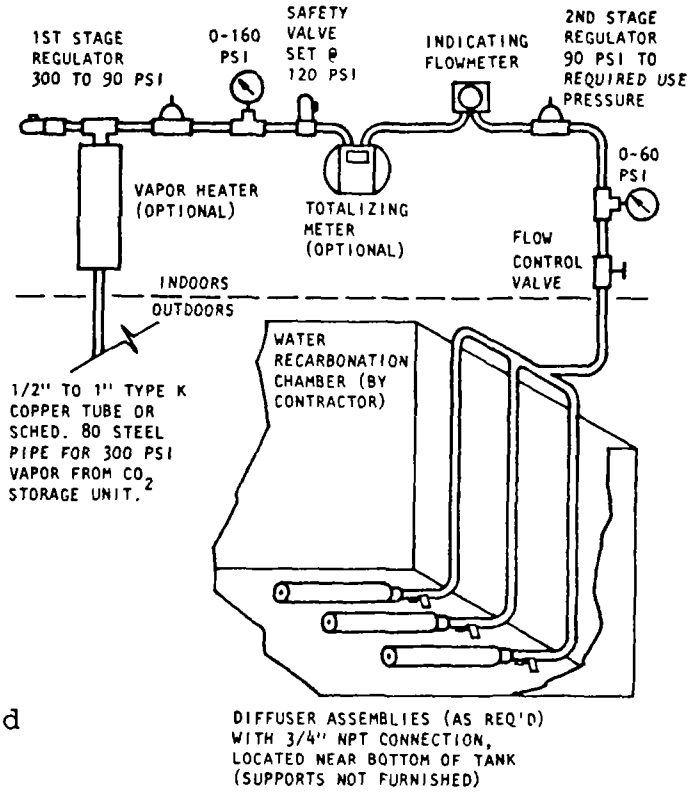
date: 2-1-80

SUBJECT: TYPICAL EQUIPMENT FOR WATER RECARBONATION

PURPOSE: This equipment is for the dispersion of CO_2 vapor into the water to be recarbonated.

DESCRIPTION OF SYSTEM:

A typical arrangement of components necessary for an economical and well regulated water recarbonation system are shown in the adjacent diagram. The quantity of diffusers and certain other items depends on quality and amount of water to be processed.



COMPONENTS TYPICALLY UTILIZED:

Req'd	Description
1	First Stage Regulator, with spring for 300 psi inlet and 90 psi outlet pressure, orifice selected for maximum flow rate desired (See Cardox Tech Spec 1037), Cardox special CO_2 regulators (See Cardox brochure CC-19), or equal.
1	Second Stage Regulator, with spring for 90 psi inlet and 0-25 psi outlet pressures, orifice selected for maximum flow rate desired (See Cardox Tech Spec 1037), Cardox special CO_2 regulators (See Cardox brochure CC-19, or equal.
1	Pressure Gauge, First Stage, 2", 0-160 psi range, ¼" bottom connection, dual scale dial, Walter Norris Engineering Company, Part Number 301-160.

(over)

CARDOX®
Division of Chemetron Corporation
Countryside, Illinois 60525
A member company of Allegheny Ludlum Industries, Inc.

CARDOX

tech specs

number: 1036-A

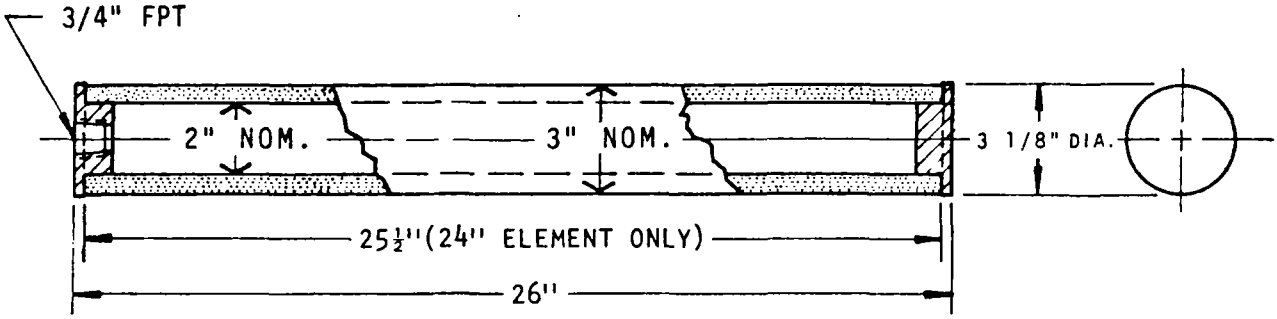
date: 2-15-79

Subject: PLASTIC DIFFUSER TUBE ASSEMBLY
Stock No. 7-937-0002

PLASTIC DIFFUSER TUBE (ELEMENT ONLY)
Stock No. 7-937-0001

PURPOSE: To promote efficient diffusion of a gas, such as CO_2, into a surrounding liquid medium so that the maximum amount will be absorbed by the liquid.

APPLICATIONS: Wastewater, pH neutralization
Potable water, pH neutralization and recarbonation



DESCRIPTION: Two styles of diffusers are available.

Stock No. 7-937-0002 is a complete assembly including PVC end caps cemented in place, one of which has a 3/4" female pipe thread connection. The porous element is made of white ultra high molecular weight polyethylene plastic with an approximate pore size of 50 microns.

Stock No. 7-937-0001 is the porous plastic element without end caps, 24" long. It is for use as a replacement in installations originally equipped with diffusers with removable end caps.

FLOW RATE: Each assembly is capable of flowing 600 SCFH of carbon dioxide vapor with less than 1 psi differential pressure. To obtain larger flows, groups of assemblies should be manifolded together.

ADVANTAGES: UHMW polyethylene plastic is inherently tough and will not shatter if accidently bumped or dropped. The tube assembly is a complete unit, so no gaskets are required and installation is simplified.

CARDOX®
Division of Chemetron Corporation
Countryside, Illinois 60525
A member company of Allegheny Ludlum Industries, Inc.

THE CLEAN WAY TO RECARBONATE

CARDOX CARBON DIOXIDE FROM CHEMETRON

CARDOX CARBON DIOXIDE MAKES THE RECARBONATION JOB CLEAN AND EASY.

Cardox carbon dioxide gives you these advantages:

IT'S CLEAN. Cardox carbon dioxide is stored as a clear, colorless liquid, in bulk. There's no mess, no smell, no smoke, no soot.

IT'S PURE. Cardox carbon dioxide is 99-plus per cent pure CO_2.

IT'S SAFE. There are no noxious combustion products passing into and through the water you're trying to keep pure. Cardox CO_2 does not include odorless but extremely toxic carbon monoxide and foul-smelling, highly irritating sulfur dioxide. With Cardox CO_2, there's no chance of contaminating your water or the atmosphere above.

IT'S EFFICIENT. Nearly every bit of the CO_2 injected into the water is instantly captured and absorbed, disappearing without a visible trace.

IT'S VERSATILE. When water quality and flow rates vary, the flow of Cardox CO_2 can be varied—instantly. With the simple adjusting of a valve.

The CO_2 storage & vaporizer equipment maintains a ready supply of vapor, whatever the demand may be at the application.

OUR EXPERTISE: AS YET-UNEXCELLED

The Cardox Products Division of Chemetron Corporation is eminently qualified to recommend the proper sized carbon dioxide supply and vaporizer equipment and help supervise its proper installation.

We have the background. Our engineers have impressive backgrounds of experience in the proper application of CO_2 through use of Cardox equipment. Many of the innovations in carbon dioxide storage and handling systems have come from this organization.

And we're ready to work with you. Our engineers can supply recommendations on a Cardox carbon dioxide system best suited to your present and future requirements. And since you can either buy or lease a Cardox system, Chemetron will prepare cost comparisons between either option and you can compare the costs against your present system.

CHEMETRON SUPPLIES THE WORKS FOR YOUR WATERWORKS' CO_2 SUPPLY.

Chemetron offers full-range Cardox systems, supply, and services for recarbonation.

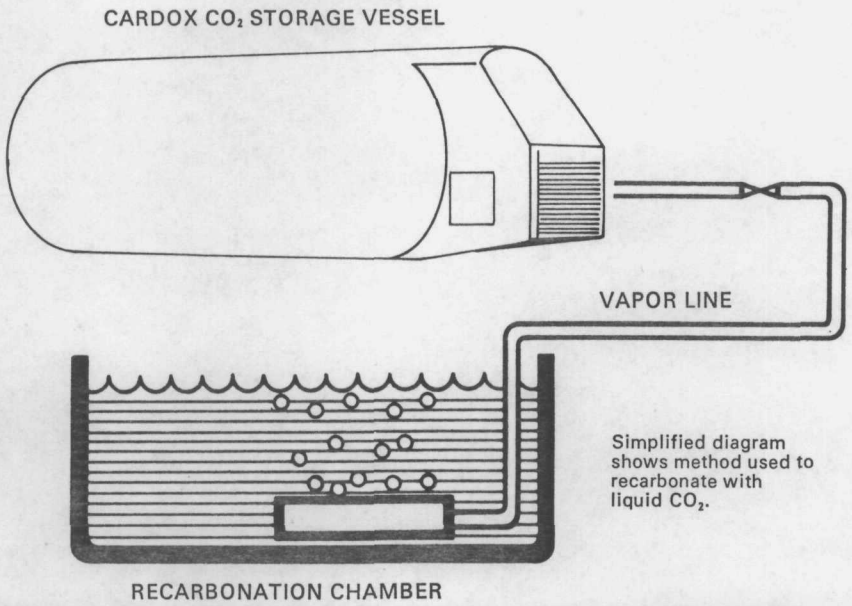
Cardox Keep-Full Delivery. We make sure we know the peaks and valleys of your carbon dioxide needs. Then we schedule our delivery of bulk liquid CO_2 to maintain your reserves. Cardox keep-full delivery means you'll never have to worry about being caught short.

Cardox Recarbonation Equipment. Here's where you keep your Cardox CO_2 always at the ready—the Cardox bulk liquid storage tank. It has a white fiberglass-reinforced resin shell for strength. And it's insulated with polyurethane foam. (Its contoured shape makes an eye-catching addition to your waterworks.) Standing alongside it would be a Cardox vaporizer of similar construction and appearance. Tank and vaporizer are made to weather the climate.

CO_2 diffuser tubes for the recarbonation tank, flowmeter, gauge(s), and regulators complete your basic Cardox package.

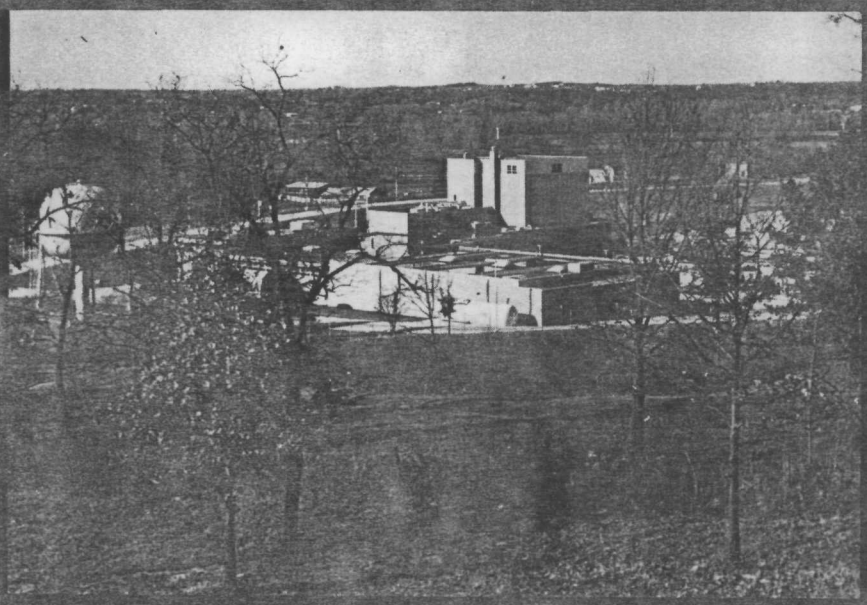
Maintenance. Chemetron field engineers will perform all required maintenance on the Cardox carbon dioxide equipment you buy or lease for a nominal charge. It's good to know that the people who built your system will be available to keep things in top working order.

Engineering Assistance. Chemetron engineers will assist the contractor who installs your system. They'll help solve any problems that may come up anytime during start-up or day-to-day operation.



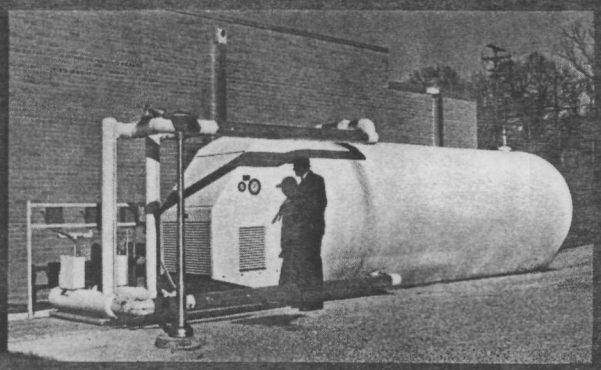
Simplified diagram shows method used to recarbonate with liquid CO_2.

JUST TWO OF THE MANY MUNICIPALITIES USING CARDOX CO_2 SYSTEMS FOR RECARBONATION:



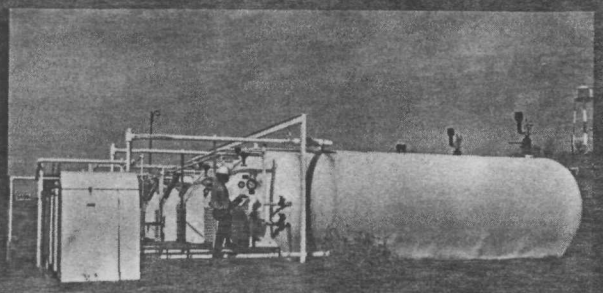
The purification plant of Water District No. 1, Johnson County, Kansas, serves a 78-square-mile area of Northeast Johnson County, with a population of approximately 185,000. The plant was recently expanded to a design capacity of 60 million gallons daily.

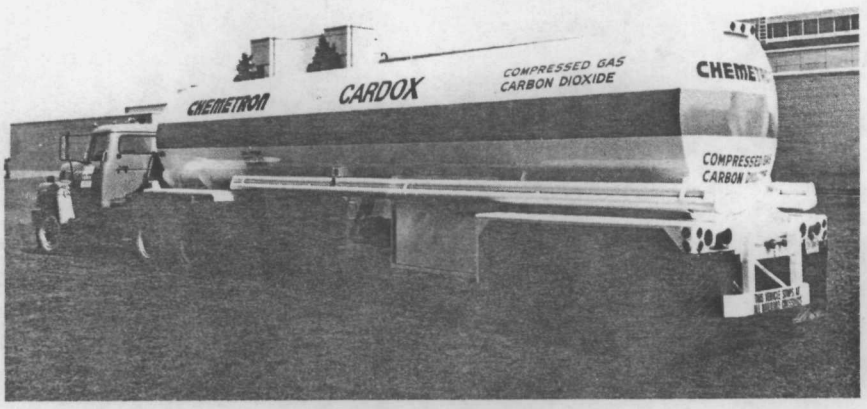
The liquid carbon dioxide tank at the Johnson County water district purification plant has a 24-ton capacity. Laboratory supervisor checks the liquid level and pressure gauges on the tank. The vaporizers and storage tank were designed by Chemetron Corporation's Cardox Products division.



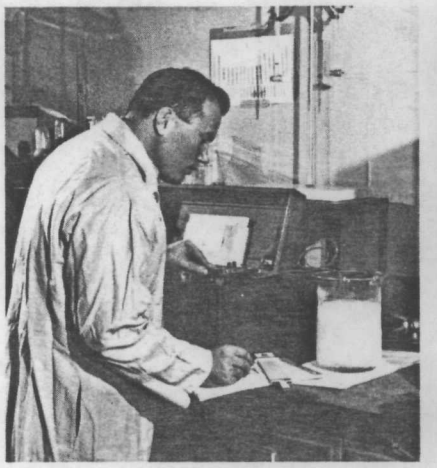
The Kansas City Water Department treatment plant at 1 N.W. Briarcliff Rd. supplies an average of 105 million gallons of water daily to over 550,000 people living in a 361-square-mile area. Recarbonation with commercial carbon dioxide is an important part of the water treatment process.

An employee of the Kansas City Water Department checks the pressure and liquid level gauges on the carbon dioxide storage tank. Generally, the only work required is daily checks of equipment.





Chemetron facilities—Carbon dioxide of the highest purity is produced under strictest quality control standards at Chemetron production plants throughout the United States. Chemetron maintains a nation-wide network of supply depots, supported by its own fleet of railway tank cars and transport trucks, to insure dependable delivery of Cardox CO_2.



Chemetron engineering and research — Always alert to trends and new demands, Chemetron growth has been built on research. Many of the methods and devices which have helped to transform carbon dioxide's potential into practical, everyday industrial applications have come from our engineers and research facilities. Chemetron Cardox Products Division pioneered the bulk method of storing and handling liquid CO_2 at low pressure. They have designed and installed fiberglass storage tanks. The external vaporizer was designed by Chemetron to provide further flexibility and economy in bulk CO_2 installations.

Chemetron services — Servicing industry's carbon dioxide needs is our organization of trained application engineers and technicians. With their knowledge and experience in meeting CO_2 requirements in chemical, food and industrial applications, they can design and install a carbon dioxide system matched to your specific operation. Users of Cardox CO_2 can rely on this service to give them the full advantages of carbon dioxide efficiency and economy.

A COURSE OF ACTION: CALL OR WRITE.
We have presented here only a brief outline of the capabilities of Chemetron Corporation in providing Cardox carbon dioxide systems for recarbonation. Your inquiry for further information will be met with an immediate response. Please write or call:

CHEMETRON™
Cardox Products
Chemetron Corporation

REGIONAL OFFICES

CALIFORNIA
San Leandro 94577
P. O. Box 2178
1470 Doolittle Dr.
415/635-9222

ILLINOIS
Chicago 60609
1111 W. 48th St.
312/254-5570

MICHIGAN
Dearborn 48121
P. O. Box 419
4610 Stecker Ave.
313/582-3030

NEW JERSEY
Union 07083
2424 Morris Ave.
201/687-4760

TENNESSEE
Memphis 38118
P. O. Box 18554
4078 Air Park St.
901/363-7310

CARDOX®
Carbon Dioxide for pH Control

Today, since our natural water resources no longer seem limitless, efficient use and reuse of process water is of prime importance. Treatment of water for recycling within a plant is quite feasible. Moreover, treatment of water prior to its discharge is necessary to recover valuable chemical additives and prevent disruption of the environment as well. Industry faces restrictions on the pH and amounts of dissolved solids which it will be allowed to discharge into the waterways.

The Alternatives

To change pH to within prescribed limits, use of acids or alkalies is the obvious method first thought of. But neutralization of process water with either a strong acid or a strong base is exceptionally difficult to control as the desired pH level is approached. Moreover, this in itself will ordinarily increase rather than reduce the amount of dissolved solids in the effluent. It is not presently feasible to attempt subsequent removal of ions introduced by acid addition.

The utilization of lime treatment followed by CO_2, however, is most promising. Not only does this allow us to recover valuable chemical additives, but it also allows us to accurately control pH. Such treatment yields solid matter that is quite rich in recoverable chemicals and an effluent that is pure enough to be recycled. Such water, moreover, is quite stable in pH and, in fact, ordinarily contains fewer dissolved solids than originally taken in.

CHEMETRON Carbon Dioxide

Action of the CO_2

The effluent from the lime treatment has a relatively high pH (10.5-11.5) and must be neutralized and stabilized by CO_2 action. Absorption of CO_2 by the effluent is rapid and the hydroxyl ions present are neutralized instantly. Additional CO_2 then acts to convert the newly formed carbonates into highly soluble bicarbonates with further attendant pH reduction.

Before this second reaction goes to completion, the water will become balanced with respect to its residual calcium carbonate content. This scale forming constituent is then unable to drop out any longer. This occurs at a pH level that inhibits the water's ability to corrode metals it may contact. Since a non-aggressive, stable water then exists, the recarbonation is usually maintained at this point (at a pH level of 8.5-9.0).

The CO_2 Supply

Chemetron's Carbon Dioxide Division obtains CO_2 in the form of a by-product gas mixture from various industrial sources. Since it can not be stored efficiently, even as a highly concentrated vapor, it is immediately liquefied after purification. This processing converts it to an exceptionally pure clear liquid having about the same density as water. Liquid CO_2 is stored at approximately 300 PSIG and 0°F. It is thereafter kept at such conditions during transport and storage at the customer's location (in tanks of up to 31 ton capacity).

For a vapor application such as this, the gaseous CO_2 above the liquid's surface is withdrawn. A vaporizer associated with the tank generates additional vapor to replenish as needed. The vaporizer is sized to maintain an adequate vapor reserve within the storage unit at the peak demand use-rate specified. At any withdrawal rate up to the rated capacity of the vaporizer, be it momentary or constant, the needed CO_2 is readily available. The storage tank/vaporizer system instantaneously provides whatever CO_2 is called for by process valves with no operator adjustments being involved.

CO_2 and Ecology

Although CO_2 is an industrial by-product gas, it is also a most vital link in nature's ecological chain. It is converted by nature into essential carbonaceous fuels. When burned to provide valuable energy, these fuels once again release CO_2. Thus CO_2 is not considered an environmental pollutant - and justifiably so.

CO_2 is an acid anhydride, forming mildly acidic carbonic acid in water. It reacts with carbonates to form bicarbonates. It can act to neutralize the harmful character of highly caustic chemicals while not reacting as violently as a strong acid would. With CO_2 use, excessive overshoot past the desired pH value is quite unlikely.

Moreover, unlike sulfates and nitrates, carbonates do not decompose in water to produce other undesirable substances. And the CO_2 content of water can be instantly and rather completely removed by subsequent water treatment. Even though sulfate and nitrate anions would be quantitatively detected, their removal would be exceptionally difficult if not impossible.

Water Treatment

To produce high purity drinking water, municipal water facilities have used lime softening for years. Essentially, in this process calcium hydroxide is added to the water, forcing calcium ions to precipitate as calcium carbonate. The CO_2 component of this carbonate was present in the water all along.

This chemical process affords some distinct advantages for industrial water treatment. The physical-chemical action occurring is in fact quite unique, not being well described by chemical equations. The results of such treatment, however, show merit. Many harmful metal ions and other deleterious impurities are removed during the precipitation process. Various methods may be employed to recover the valuable ingredients of the solid material precipitated.

With such a CO_2 system the drawbacks of an inert gas gen[illegible]or, such as turn down ratio limitations and high temperature CO_2 within pipelines, are avoided. Moreover, unlike acid systems, special piping to hold a corrosive chemical is not required. There is no heat-of-dilution or sensible-heat-input to the water. Nor must noxious gases of combustion such as SO_2 and CO be contended with.

Equipment Service Life

Note that the Cardox equipment isn't subjected to a corrosive chemical reagent or a combustion process. Thus, as opposed to both acid storage tanks and gas generators, it is not vulnerable to attack from the reagent it holds or provides. If it receives a minimum of proper periodic maintenance it should last indefinitely. For this reason, it may either be leased or purchased, whichever is the more desirable arrangement. Amortization of the capital investment for such CO_2 equipment need not be based on merely a 5 to 7 year period. Indeed, Cardox units that have been leased longer than this have quite often been subsequently purchased.

Summary

The advantages of commercial CO_2 for pH control in industry are yet to be fully realized. The use of Cardox carbon dioxide allows one to avoid the hazards associated with diluting acids or generating CO_2 on site. Impurities of "technical grade" chemicals need not be a consideration if 99+ percent pure Cardox CO_2 is employed instead. This docile chemical can be stored indefinitely (without loss or degradation of quality) in equipment needing but a minimum of routine maintenance. Unexpected process disruptions resulting from equipment malfunction are unlikely to occur. These are but a few of the innumerable reasons Cardox systems are ideally suited to this application.

For Further Information Contact your nearest Chemetron Carbon Dioxide Office or write to Technical Services Department:

CHEMETRON

CARDOX DIVISION
CHEMETRON CORP.
5230 S. EAST AVE.
COUNTRYSIDE, IL 60525